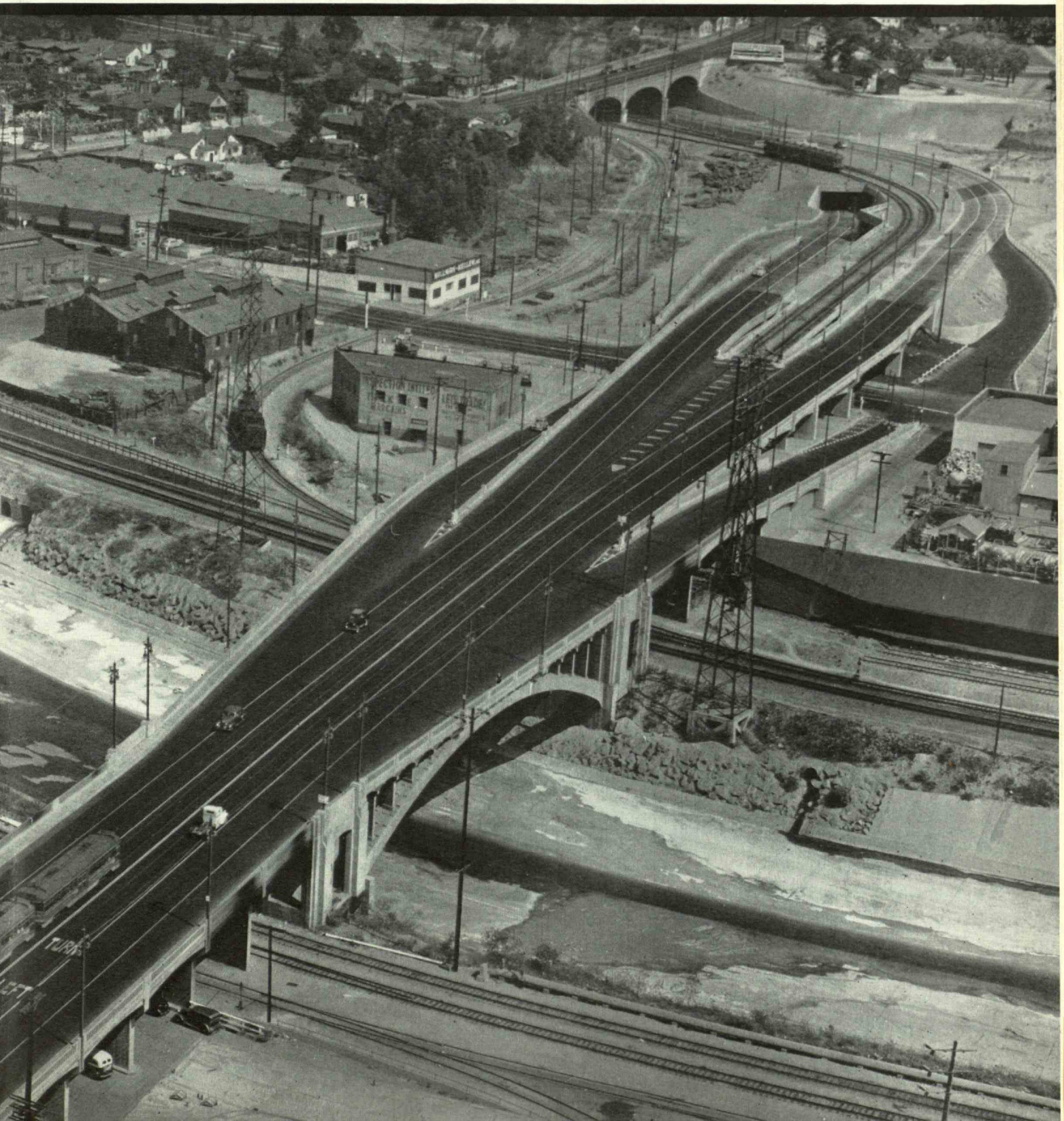
January 1945

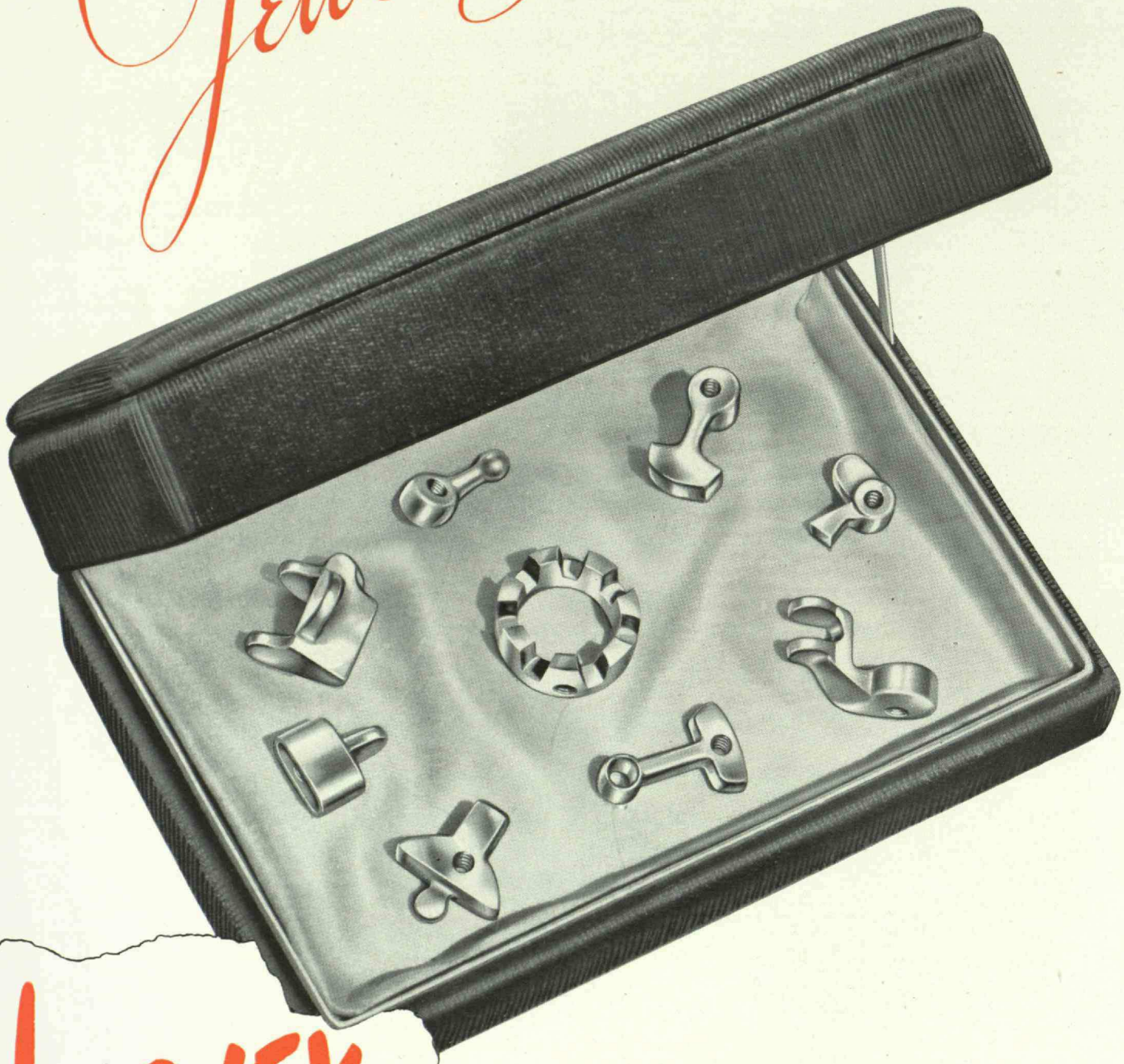
TECHNOLOGY REVIEW

Title Reg. in U. S. Pat. Office



technology
review
Published by MIT

FORGINGS ACTUALLY *Jewel-Like* IN THEIR PERFECTION



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MACHINING FACILITIES

THE TECHNOLOGY REVIEW, January, 1945. Vol. XLVII, No. 3. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.

SHUTTLE SERVICE OVER MARCO POLO'S TRAIL

It is written that no man ever equalled Marco Polo's "speed" record in crossing Asia afoot. It took him six years.

In hours today, high-flying transports shuttle over much the same route, keeping China's life-line intact, winging tons of vital war materials to our fighting allies. Pilots fly this route, confident that plane and engine will deliver the goods.

Helping to push service ceilings even higher and non-stop ranges ever wider are the aviation products of American Bosch. Aviation magnetos perform dependably from sea level to the ceiling — in air temperatures that vary from +130° to −70° in a matter of minutes. Starting vibrators send fighters into the air faster. And new fuel injection equipment adds another plus to American plane excellence.

In the peace to come as in war today, American Bosch research, engineering counsel, production and maintenance facilities will continue to serve all branches of the internal combustion engine industry.

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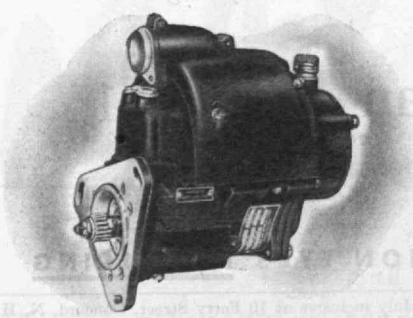
Springfield, Massachusetts



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These frail castings are ground on two sides flat and parallel on a No. 18 Blanchard Surface Grinder. They measure 23½" x 21½" x 11" and 5/32" stock is removed from each side. One piece is ground at a time, lightly held by clamps to a steel base plate which is magnetically held on the chuck. Two pieces, four surfaces, are finished per hour.

If you have work, large or small, that requires flatness, squareness, parallelism and fine finish, "put it on the Blanchard" for best and fastest results.

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The casual observer is usually amazed when he sees a huge and intricate assembly of walls, towers, tanks, piping and other equipment rise "like magic" from what once may have been a barren field. But to Badger, swift plant construction is an achievement in "know how" organization . . . organization of physical materials, engineering talent, labor, procedure—and timing.

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Is time lapse an important cost factor in the new plant, addition or modernization you are planning?

Where every day saved in getting into operation means valuable sales advantages, consider Badger's facilities for speed by what Badger records show. We welcome the opportunity to lay such records before you.

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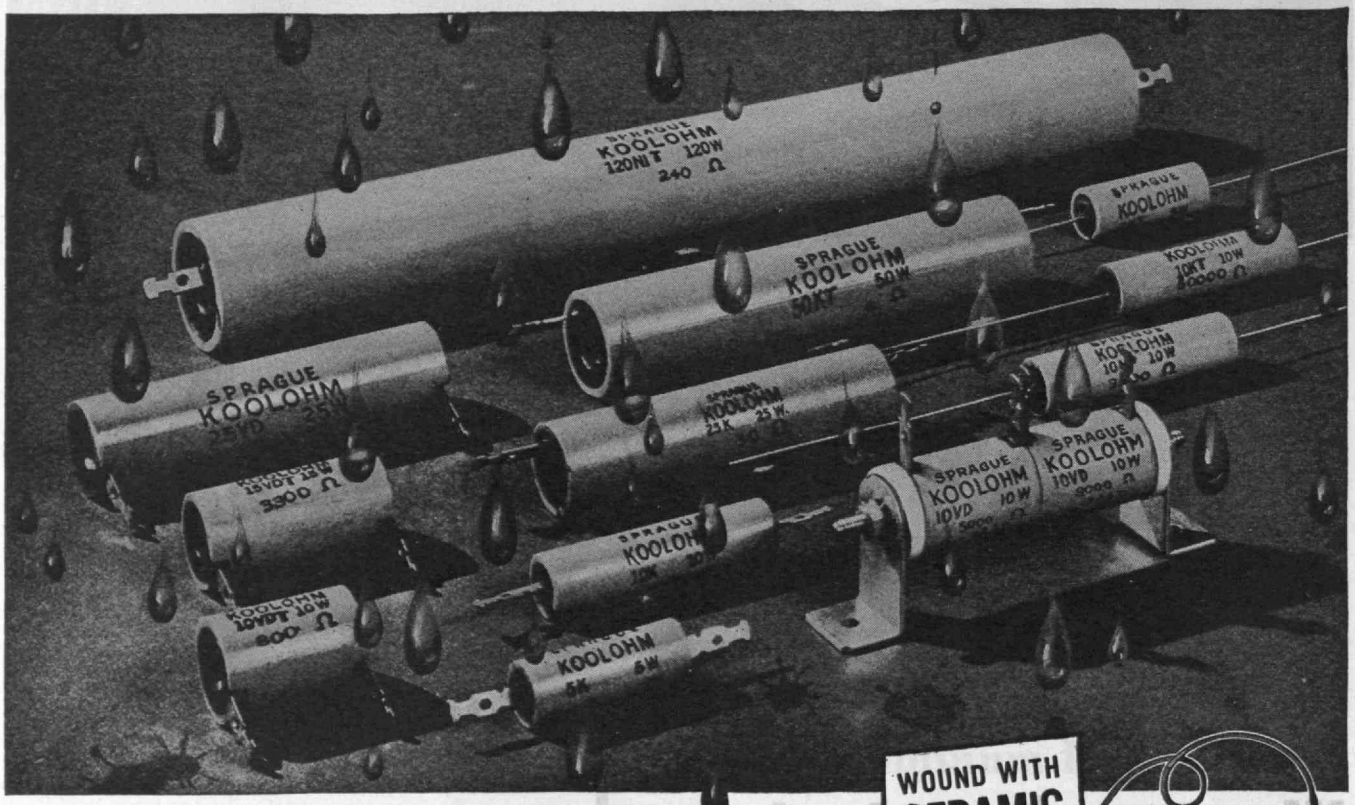

. . . designed for tropical conditions
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Standard Sprague Koolohm Wire Wound Resistors now offer the same high degree of humidity protection formerly obtainable only on special order to match exacting military specifications. This construction, newly adopted as standard, includes a glazed ceramic outer shell and a new type of end seal. These features give maximum protection against even the most severe tropical humidity conditions. Type numbers remain the same except for the fact that the letter "T" has been added to designate the new standard construction.

Thus, again, Sprague leads the way in practical, truly modern wire wound resistor construction. Your job of resistor selection is greatly simplified. No need to study and choose between types or coatings. One type of Koolohms, the *standard* type, does the job —under any climatic condition, anywhere in the world!

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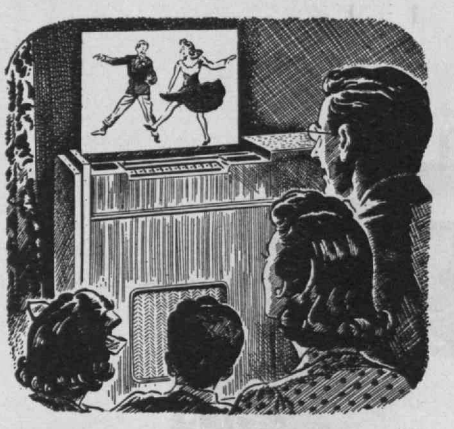
The Greatest Wire-Wound Resistor Development in 20 Years

General Electric answers your questions about

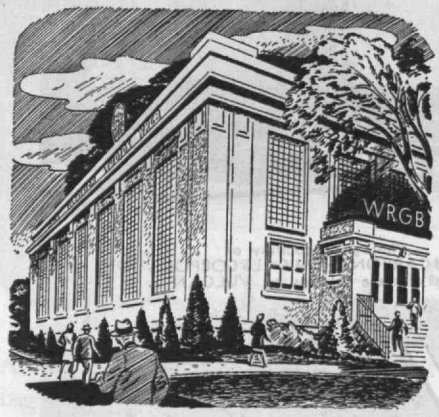
TELEVISION



Q. What will sets cost after the war?
A. It is expected that set prices will begin around $200, unless there are unforeseen changes in manufacturing costs. Higher priced models will also receive regular radio programs, and in addition FM and international shortwave programs. Perhaps larger and more expensive sets will include built-in phonographs with automatic record changers.

Q. How big will television pictures be?
A. Even small television sets will probably have screens about 8 by 10 inches. (That's as big as the finest of pre-war sets.) In more expensive television sets, screens will be as large as 18 by 24 inches. Some sets may project pictures on the wall like home movies. Naturally, pictures will be even clearer than those produced by pre-war sets.

Q. What kind of shows will we see?
A. All kinds. For example: (1) Studio stage shows—dancers, vaudeville, plays, opera, musicians, famous people. (2) Movies can be broadcast to you by television. (3) On-the-spot pick-up of sports events, parades, news happenings. G.E. has already produced over 900 television shows over its station, WRGB, in Schenectady.



Q. Where can television be seen now?
A. Nine television stations are operating today—in Chicago, Los Angeles, New York, Philadelphia, and Schenectady. Twenty-two million people—about one-fifth of all who enjoy electric service—live in areas served by these stations. Applications for more than 80 new television stations have been filed with the Federal Communications Commission.

Q. Will there be television networks?
A. Because television waves are practically limited by the horizon, networks will be accomplished by relay stations connecting large cities. General Electric set up the first network five years ago, and has developed new tubes that make relaying practical. G-E station WRGB, since 1939, has been a laboratory for engineering and programming.

Q. What is G. E.'s part in television?
A. Back in 1928, a General Electric engineer, Dr. E. F. W. Alexanderson, gave the first public demonstration. Before the war, G. E. was manufacturing both television transmitters and home receivers. It will again build both after Victory. Should you visit Schenectady, you are invited to WRGB's studio to see a television show put on the air.

TELEVISION, another example of G-E research

Developments by General Electric scientists and engineers, working for our armed forces in such new fields as electronics, of which television is an example, will help to bring you new products and services in the peace years to follow. *General Electric Company, Schenectady, N. Y.*

Hear the General Electric radio program: "The G-E All-Girl Orchestra," Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.

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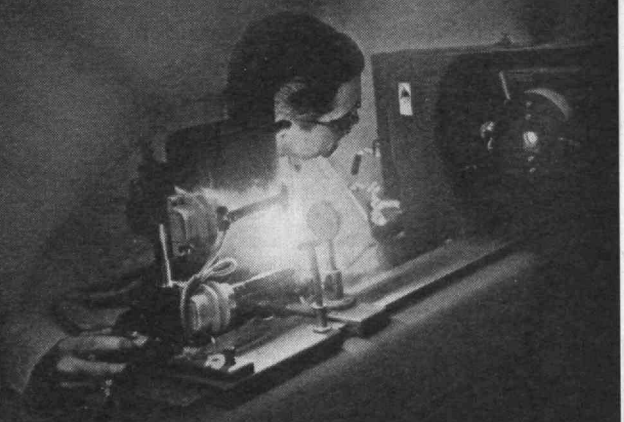

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How Secret Weapons are Born . . .

A brightly lighted laboratory window in a darkened building . . . a closely guarded door . . . by signs such as these you may recognize the hardworking scientists who are creating America's deadliest new fighting tools, through the O.S.R.D. (Office of Scientific Research and Development). Armed with the instruments which science knows best how to use, these selfless six thousand have already saved unnumbered lives, countless ships and planes.

They work in hundreds of laboratories throughout the country, laboratories which are equipped with the finest precision optical instruments. Their work is coordinated by a scientific high command, the O.S.R.D. They wear no uniforms nor medals, but work tirelessly for the triumph of Freedom.

We are proud to be able to cooperate with the scientists working under O.S.R.D.; proud, too, of the part that our instruments have played in the furtherance of their efforts. In the able hands of these men the microscopes, spectrographs, metallographs, refractometers, projection equipment, and other specialized Bausch & Lomb instruments have become weapons of war . . . as important to the winning of battles as the rangefinders, aerial camera lenses, binoculars, and other B&L military optical instruments.

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THE TABULAR VIEW

Credo. — Entering on a new year sure to be significant in the history of science, The Review is glad to open its January issue with an essay (page 162) by VANNEVAR BUSH, member of the Class of 1916, Vice-president of Technology from 1932 through 1938, now President of the Carnegie Institution of Washington and Director of the Office of Scientific Research and Development. Few others are so well fitted by insight and sympathy as Dr. Bush to state the faith and name the work of science. Readers familiar with Rudyard Kipling's "The Palace" will find their memories of it vitalized and enriched by Dr. Bush's essay. The photograph of the New York sky line which accompanies it is by Paul Cohen, '35, long-time able Editorial Associate of The Review.

Light. — Among the extra stimuli which war has brought to portions of American industry, few are more notable than the swift expansion in manufacture and utilization of magnesium. Greater supply and vastly augmented facilities indicate that the metal is sure to become an accustomed part of postwar living. The transition can hardly occur, however, without problems; both problems and prospects are surveyed (page 167) by MAJOR ARTHUR LOWERY in the first part of a report on the whole field. A member of the Institute Class of 1932, Major Lowery after varied experience in engineering and industry went as an industrial specialist to the aluminum and magnesium branch of the War Production Board in 1941 and is at present on informal loan from the Army Air Forces to serve as chief of the magnesium wrought products and development section of the W.P.B.

Spurt. — Rockets and jet propulsion are large in the grim news of war; the theory and history behind them hence take on added import. WILLY LEY, who discusses (page 169) German developments of this type, is familiar with their history through his pre-Hitler association with the German Rocket Society, and with their theory through long study and experiment. An Editorial Associate of The Review and a prolific writer on engineering and science, Mr. Ley is director of engineering of the Burke Aircraft Corporation in Atlanta, Ga.

Factotum. — That microbes — "germs" in the vernacular — have much to recommend them is a truth too often popularly ignored. The work of some beneficent micro-organisms as described (page 171) by FREDERIC W. NORDSIEK is both a fascinating story and an essential in industry. Mr. Nordsiek, a graduate of the Institute in 1931, is an editorial associate of The Review and a frequent contributor, particularly on topics in public health and food technology.

Change. — Concluded in this Review (page 173) is a distinguished study in culture history — analysis and appraisal of the development and relationship of American patent furniture and railway passenger-car accommodations — through which SIGFRIED GIEDION reaches significant conclusions concerning social thinking in this country and its influence elsewhere. Dr. Giedion's article derives from research in process for a detailed study of the influence of mechanization upon present-day life.

MAIL RETURNS

About the Unloaders

FROM Dean H. W. McKIEL:

For some time I have enjoyed reading The Review, which comes to my desk every month. I consider it one of the outstanding publications in its field, and I think that your editorial board has every reason to be proud of it.

I enjoy reading the column "Mail Returns," and I have just read the letter in the November issue (page 70) from Gerard Chapman, '36, which you headed, "We Blush." While I am not in a position to pass on the main part of Mr. Chapman's letter, I think that he is quite in error in his last sentence, for at the Canadian Soo is located the Algoma Steel Corporation, a corporation small in size probably, as compared with United States Steel, but one which does supply a fair proportion of Canadian steel production. Thus there would be nothing incongruous in an ore vessel's unloading ore at the Soo.

I know that you are interested in the accuracy of the statements which appear in The Review and so I take the liberty of drawing your attention to these facts.

Mount Allison University
Sackville, New Brunswick

FROM RALPH H. SWEETSER, '92:

The letter to you from Gerard Chapman, '36, on page 70 of the November issue is 50–50 correct. He is right about the ore unloaders at lower Lake ports but wrong about the ore unloaders at the Soo. Before me now is a clipping from the May 28 issue of the New York *Herald Tribune* showing the ore bridges of the Algoma Steel Corporation at Sault Ste Marie, Ontario, unloading ore for the blast furnaces seen in the background. This is a true picture, for I was superintendent of the blast furnaces and docks in 1904 when they were first put into operation.

Rusk, Texas

FROM ROBERT E. TOUZALIN, '39:

For the benefit of Gerard Chapman and others who may not be acquainted with Sault Ste Marie, Ontario, I should like to point out that it is the location of the Algoma Steel Corporation, Ltd., one of the three large steel companies in Canada. Algoma Steel's equipment includes five blast furnaces — one of them the largest in the British Empire — four batteries of coke ovens, by-product plant, open-hearth plant, duplex plant, blooming mills, rail and structural mill, merchant mills, power plant, and tin-plate mill. It is possible that the picture in the New York *Times* was actually taken at Sault Ste Marie. Algoma does not own any Hulett unloaders, such as those shown in the June issue of The Review, but does have three ore bridges which unload boats and three Heyl and Patterson coal unloaders.

Cleveland, Ohio

What is more vital to you than Food and Water?

MEN HAVE LIVED forty days without food—perhaps even longer. They have gone several days without water—and lived. But without sufficient oxygen, life is snuffed out in a matter of minutes.

Normally, a person obtains plenty of oxygen by breathing air. But following bomb blasts, shock from battle wounds, heart attacks, during severe cases of pneumonia, and after major operations, additional quantities of oxygen may be prescribed. The treatment is known as oxygen therapy.

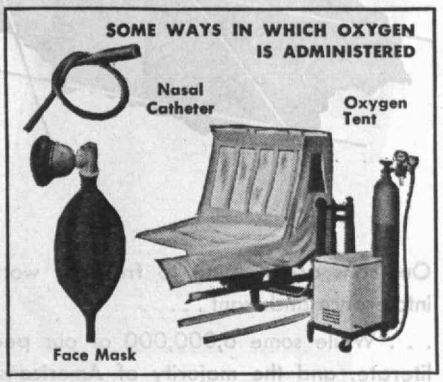
The breathing of extra oxygen also is required by all flyers in the rarefied atmosphere of high altitudes. The study of this use is contributing important data to that which the medical profession's continuing research has made available on the clinical use of oxygen.

The LINDE AIR PRODUCTS COMPANY, a Unit of UCC, is devoted to the production of oxygen. Every cylinder of Linde Oxygen, even Linde Oxygen for industry, conforms to the purity standards of the United States Pharmacopoeia—and is therefore suitable for human consumption.

▼

Oxygen therapy, once used as a last resort, is now routine early treatment. It should be welcomed by patient and family as an oxygen mask is welcomed by a flyer.

Civilian and military physicians and nurses and others are invited to send for booklet P-1, "Oxygen Therapy Handbook" which describes generally the types of equipment with which oxygen is administered.



IN AN EMERGENCY Linde Oxygen U.S.P. can be obtained from garages, welding shops and industrial plants.

▼

IMPORTANT: All U.S.P. oxygen must undergo extra drying procedures before it can be used for high altitude flying.

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PLASTICS—Bakelite Corporation

PEACE PLAN!

Our sons are fighting to free the world from ignorance, intolerance and want . . .

. . . While some 6,000,000 of our people are wholly illiterate, and the majority of Americans have less than a completed high school education.

. . . While there were more than 3,000 strikes during the past year, some of the bloodiest of which were based upon race intolerance.

. . . While more than one-third of this nation's dwelling units are still without flush toilets or any bathing facilities whatever. Ignorance, intolerance and want!

America will soon have the chance to help write a peace plan for the rest of the world — and that plan can begin here at home. For our country's greatest immediate contribution to world reconstruction and peace would be to make ourselves lastingly strong, with jobs enough for all.

Today, the engineers of the machine tool industry can greatly help the men of government and of industry to write that plan . . . to prepare now for the reconversion of our tremendous wealth of resources, skills and machinery to all-out production for a better America! One of these engineers is a Bryant man, and we invite you to call upon him now.

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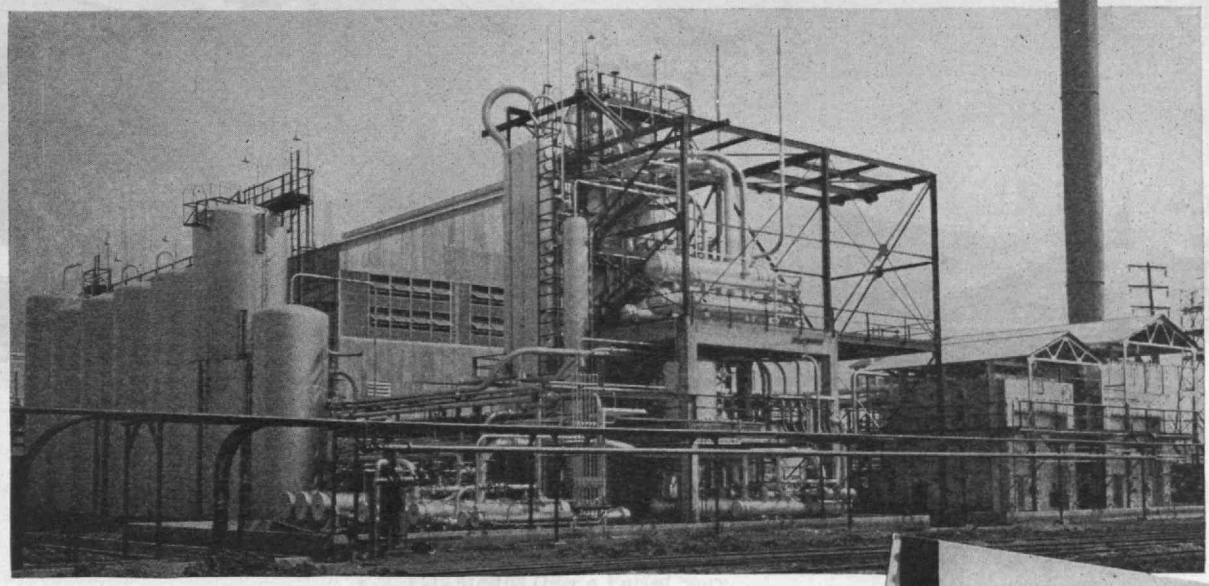

High yields . . . high viscosity index . . . low pour point with equivalent cloud, and good color characterize the quality lubricating oils produced by this combination of processes. Lummus has built 14 solvent refining plants, 19 solvent dewaxing units and several complete lube oil refineries.

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THE LUMMUS COMPANY, 420 Lexington Ave., New York 17, N. Y.

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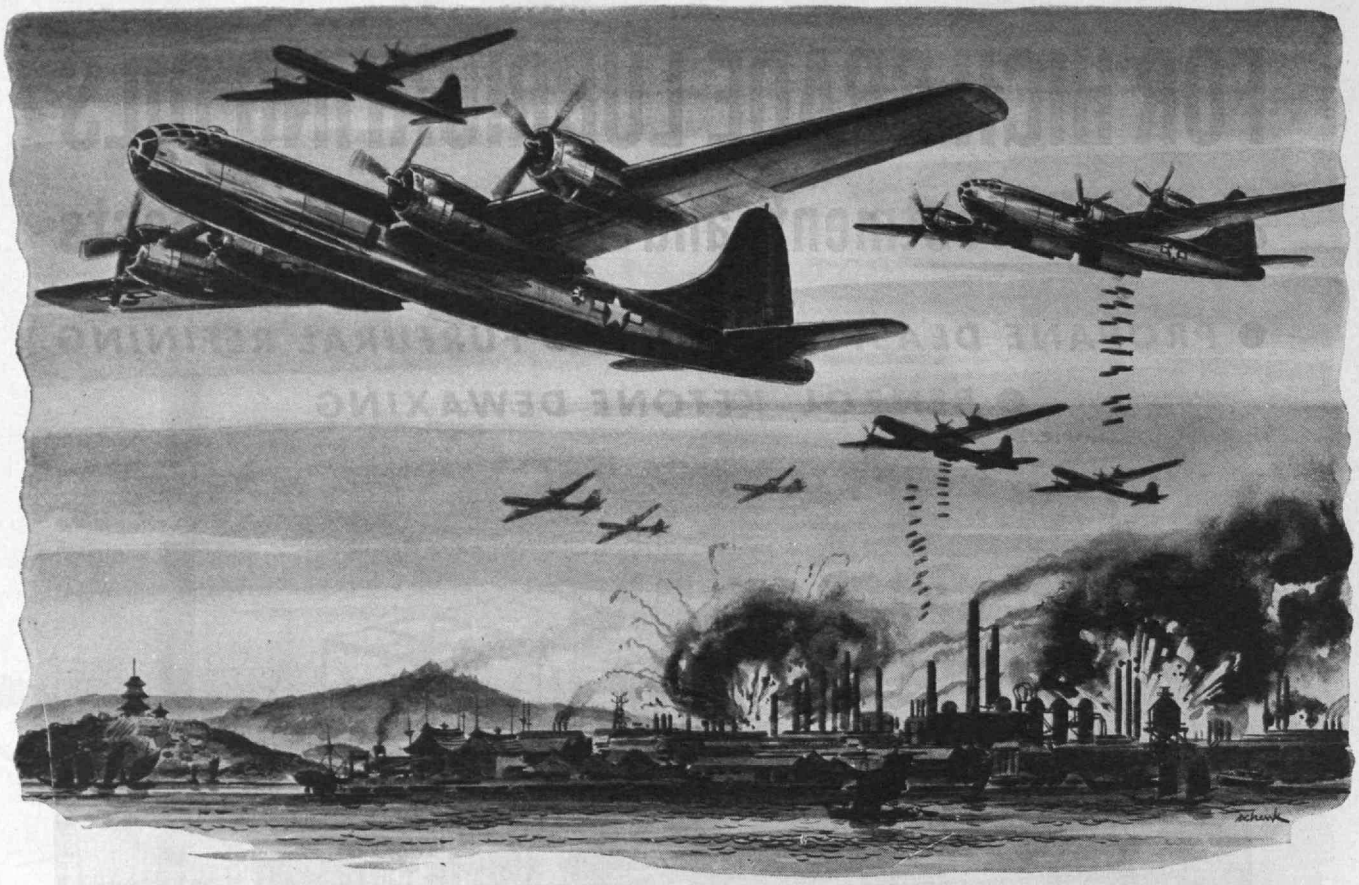


NEW THRILLS FOR OLD SKILLS

BUILDING aircraft from light metals, from aluminum and magnesium alloys as well as from the high strength steel alloys, was an old skill to Goodyear engineers with years of pioneering behind them. But producing, in large quantities, components for such war wonders as the Superfortress bomber and the Black Widow night fighter, has meant a series of thrilling new accomplishments in engineering. War record of the 14 planes for which Goodyear Aircraft Corporation has built major components, as well as the successes of Navy patrol airships and the famous Navy Corsair, speaks well for the skills of Goodyear—one of the great names in aircraft. *Goodyear Aircraft Corporation, Akron, Ohio.*

GOODYEAR
AIRCRAFT

BUY WAR BONDS BUY FOR KEEPS

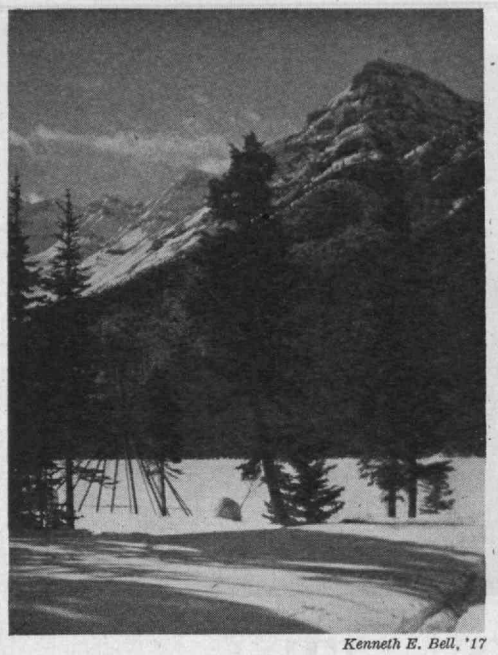
VOLUME 47 NUMBER 3

THE TECHNOLOGY REVIEW

TITLE REGISTERED U. S. PATENT OFFICE

EDITED

AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY



Kenneth E. Bell, '17

Winter in Rocky Mountain Park, Alberta

CONTENTS for JANUARY, 1945

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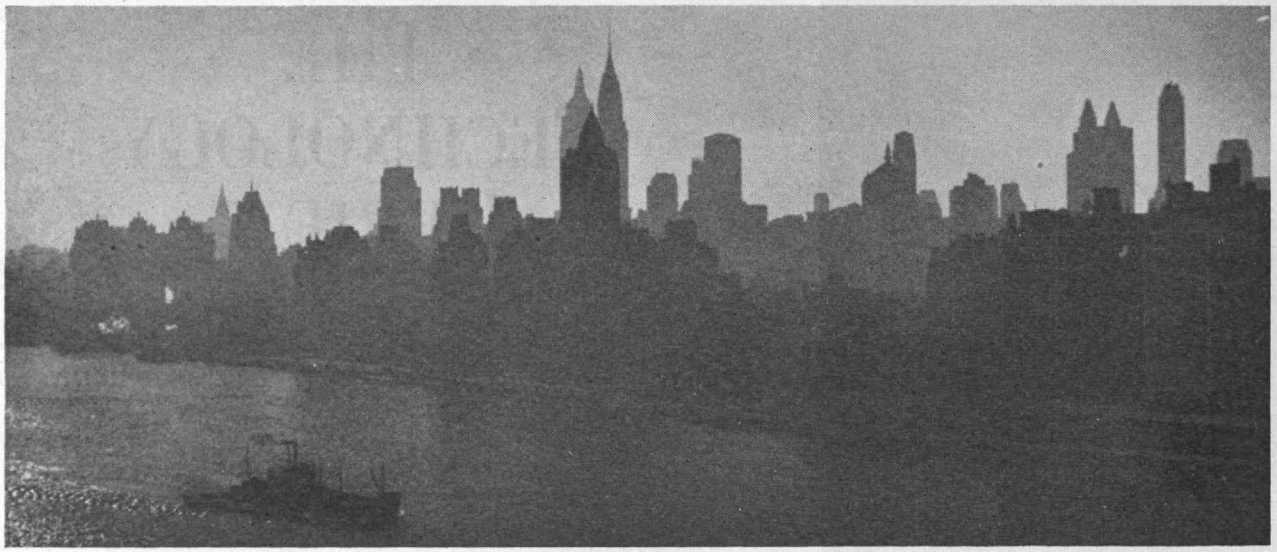


The Builders

THE *process by which the boundaries of knowledge are advanced, and the structure of organized science is built, is a complex process indeed. It corresponds fairly well with the exploitation of a difficult quarry for its building materials and the fitting of these into an edifice; but there are very significant differences. First, the material itself is exceedingly varied, hidden and overlaid with relatively worthless rubble, and the process of uncovering new facts and relationships has some of the attributes of prospecting and exploration rather than of mining or quarrying. Second, the whole effort is highly unorganized. There are no direct orders from architect or quarrymaster. Individuals and small bands proceed about their businesses unimpeded and uncontrolled, digging where they will, working over their material, and tucking it into place in the edifice.*

Finally, the edifice itself has a remarkable property, for its form is predestined by the laws of logic and the nature of human reasoning. It is almost as though it had once existed, and its building blocks had then been scattered, hidden, and buried, each with its unique form retained so that it would fit only in its own peculiar position, and with the concomitant limitation that the blocks cannot be found or recognized until the building of the structure has progressed to the point where their position and form reveals itself to the discerning eye of the talented worker in the quarry. Parts of the edifice are being used while construction proceeds, by reason of the applications of science, but other parts are merely admired for their beauty and symmetry, and their possible utility is not in question.

In these circumstances it is not at all strange that the workers sometimes proceed in erratic ways. There are those who are quite content, given a few tools, to dig away unearthing odd blocks, piling them up in the view of fellow workers, and apparently not caring whether they fit anywhere or not. Unfortunately there are also those who watch carefully until some industrious group digs out a particularly ornamental block, whereupon they fit it in place with much gusto and bow to the crowd. Some groups do not dig at all, but spend all their time arguing as to the exact arrangement of a cornice or an abutment. Some spend all their days trying to pull down a block or two that a rival has put in place. Some, indeed, neither dig nor argue, but go along with the crowd, scratch here and there, and enjoy the scenery. Some sit by and give advice, and some just sit.

On the other hand there are those men of rare vision, who can grasp well in advance just the block that is needed for rapid advance on a section of the edifice to be possible, who can tell by some subtle sense where it will be found, and who have an uncanny skill in cleaning away dross and bringing it surely into the light. These are the master workmen. For each of them there can well be many of lesser stature who chip and delve, industriously, but with little grasp of what it is all about, and who nevertheless make the great steps possible.

There are those who can give the structure meaning, who can trace its evolution from early times, and describe the glories that are to be, in ways that inspire those who work and those who enjoy. They bring the inspiration that all is not mere building of monotonous walls, and that there is architecture even though the architect is not seen to guide and order.

There are those who labor to make the utility of the structure real, to cause it to give shelter to the multitude, that they may be better protected, and that they may derive health and well-being because of its presence.

And the edifice is not built by the quarrymen and the masons alone. There are those who bring them food during their labors, and cooling drink when the days are warm, who sing to them, and place flowers on the little walls that have grown with the years.

There are also the old men, whose days of vigorous building are done, whose eyes are too dim to see the details of the arch or the needed form of its keystone; but who have built a wall here and there, and lived long in the edifice, who have learned to love it and who have even grasped a suggestion of its ultimate meaning; and who sit in the shade and encourage the young men. — VANNEVAR BUSH

THE
TECHNOLOGY
REVIEW

Vol. 47, No. 3 January, 1945

The Trend of Affairs

Lustered Lusters

DURING 1945, a considerable number of lustral marks interesting because of their relation to the history of science and engineering will be visible on the rim of time's wheel. Particularly in the annals of prime movers, of electricity, and of textiles will 1945 offer memorable dates to those of an antiquarian turn of mind. Thus it will be the 240th anniversary of the patent which Thomas Newcomen, as legend hath it, secured in 1705 for his atmospheric steam engine. Whether he received the patent or not, he was actively at work on the problem of the engine in that year. Sixty years thereafter, in 1765, James Watt conceived the idea of a separate condenser which would overcome the energy losses of the Newcomen engine. Watt's experimental model operated successfully in 1765, and by the mid-1770's he had overcome the difficulties of going from pilot plant to operating installation in those days of less efficient machine tools.

The four lustrums which began with 1765 were productive of ideas and applications destined to justify Watt's work and to create ample demand for the power which the perfecting of his invention could finally supply. James Hargreaves' invention of the spinning jenny, made in 1765, enabled one operator to work eight spindles and very soon 80, in the production of yarn. In the same year, on December 8, occurred the birth of Eli Whitney, whose cotton gin would in later years speed up the supply of raw cotton for the speeding spindles. In 1775, Richard Arkwright introduced the water frame, a spinning machine producing an unusually firm thread and so making possible the manufacture of an all-cotton fabric. Samuel Crompton was to draw both on Arkwright's frame and on Hargreaves' jenny in developing the mule. The modern power loom has its origin in the power loom on which Edmund Cartwright was granted a patent in 1785. The score of years concluded with the Cartwright patent had seen developments destined to sway the affairs of nations in the years to come, positively as in the growth of Manchester or in the opening of Africa to make a market for the product of Manchester looms, negatively as in Mohandas K. Gandhi's campaign for Indian self-sufficiency. Appropriately or not, it was another -5 year, something over a century later — 1895 — that saw the beginning of a new textile cycle in the development of acetate rayon by the Englishmen Cross and Bevan.

To the electrical and electronic world likewise, 1945 should bring many occasions for reminiscence and commemoration. Two centuries ago this year, the clergyman E. G. von Kleist of Pomerania devised the means of storing static electricity which came to be called the Leyden jar after, in the next year, it had been independently discovered in that city by Pieter van Musschenbroek. The Leyden jar was the first electrical condenser. Ninety years later, in 1835, the effect of the discharge of such a jar on a pile of iron filings came under study, out of which grew the principles embodied in the Branly coherer and used in the first receivers for wireless telegraphy. The year of Von Kleist's discovery was also that of the birth of Alessandro Volta, whose name is immortalized in the vocabulary of engineering as is that of André Marie Ampère, whose birth occurred in 1775. It was on June 2, a century later, that Alexander Graham Bell verified the principle of the electric speaking telephone, by transmitting the sound of a twanging wire over his experimental model at 109 Court Street in Boston. Bell and Elisha Gray filed patents for a practical telephone on the same day in this year, in which Thomas A. Edison discovered "etheric force" but did not associate it with electric waves as Hertz was destined later to do. In 40 years, the telephone had advanced from the ability to carry a twanging tone a few feet to the power of linking the American coasts with speech; the first transcontinental demonstration took place on January 25, 1915, Lee deForest's audion being used as a repeater.

Wilhelm Konrad Roentgen's discovery of x-rays was made in Würzburg in November, 1895. That development in this field has been justly comparable to that in the

transmission of auditory intelligence either by Bell's invention or by Edison's elusive etheric force is clearly suggested elsewhere in this section of The Review.

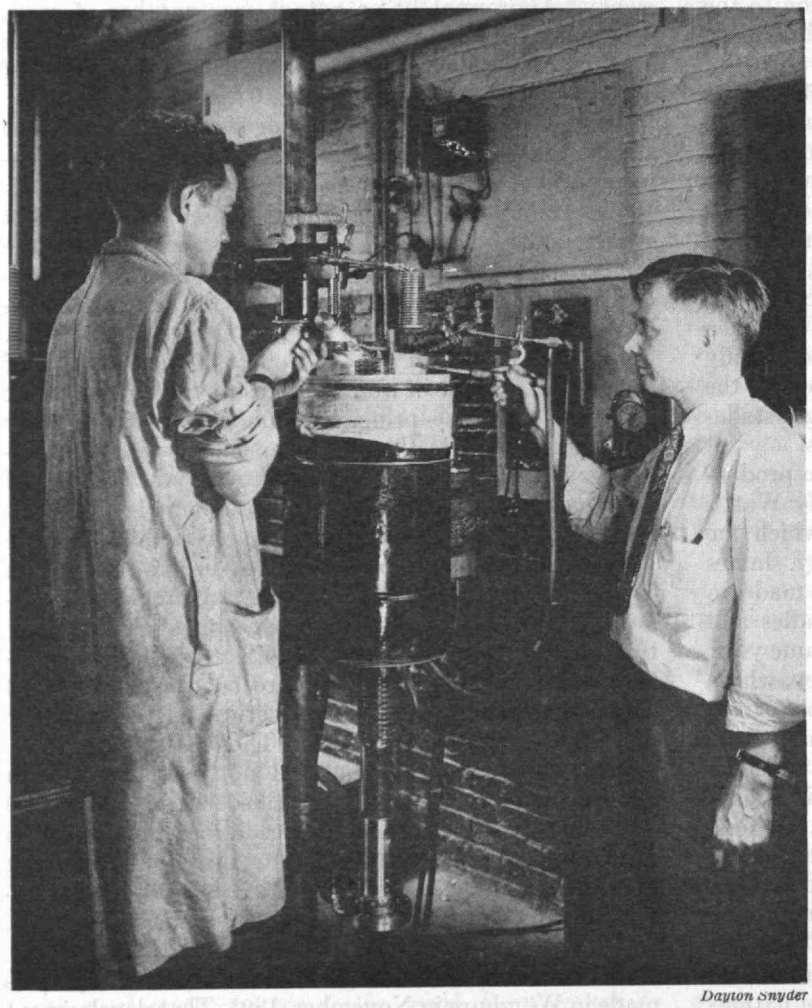
So much for essentially selective angling in the seas of history. For connoisseurs of the chronological, a few casts with nets of number -5 mesh may yet be made. The catch is diverse: In 1785, John Fitch presented to the American Philosophical Society his plans for a vessel to be driven by steam. In 1815, Humphry Davy began work on the safety lamp for miners which was brought into use the next year and which was to make its inventor a baronet. It was in this year that Augustin Jean Fresnel commenced the experimental studies which were to result in publication whereby he contributed so greatly to the success of the wave theory of light — the first breach in Newtonian physics, according to Albert Einstein. Completion and dedication of the Erie Canal occurred 10 years later, in 1825, and 10 years after that, 1835, the first cast-iron bridge in the United States was erected over Dunlap's Creek at Brownsville, Pa. It was built by John Snowdon from the designs of John Herbertson. Another decade, and in 1845 the Eastern Hotel in Boston, built in that year, became the first building in the United States to be heated by steam. R. W. Thompson in England in this year received a patent for a pneumatic tire, his being the first expression of the idea which was to have its real introduction by John B. Dunlop some four decades later.

The Bunsen burner, credit for which according to some authorities should go to Peter Desdga if not to Michael Faraday, dates from 1855 in numerous chronicles. There is little question about an event of 10 years later — the establishment in 1865 of the first architectural school of collegiate rank, that of the M.I.T., with William R. Ware as its first professor of architecture. This year saw also the operation of the first press to print from a continuous reel or web of paper, that developed by William Bullock, which preceded by three years the famous Walter rotary perfecting press of the London *Times*.

The passage of two decades brought two other inventions of profound significance to the dissemination of knowledge and pseudo knowledge — the patenting in 1885 by Ottmar Mergenthaler of the type-slug casting machine which was the forerunner of the Linotype, and in the same year the filing of application by Tolbert Lanston for a patent on the typecasting machine which became the Monotype. This was the year of graduation from Oberlin College of Charles Martin Hall, who while still a student had tackled the task of developing a cheap method for the reduction of aluminum from its ores, which he accomplished some eight months after receiving his degree. The brothers Alfred and Eugene Cowles, who had produced aluminum alloys in the 1880's, succeeded in 1885 in producing at their Electric Smelting and Aluminum Company in Lockport, N. Y., silicon carbide, which later under the trade name "Carborundum" was to be manufactured by E. G. Acheson and to play a major role in the development of precision manufacturing.

Carl Linde in Germany put the Joule-Thomson cooling effect to work in his experimental plant for the liquefying of air, which was first operated in May, 1895. This was the year of United States Patent No. 549,160, issued on November 5, 1895, to George B. Selden, important in the history of the development of the American automobile industry.

Getting nearer to our own time, history reminds that a German submarine torpedoed the Cunard liner *Lusitania* 30 years ago next May 7, that the human voice was first transmitted across the Atlantic by radio telephone 30 years ago next October 21, that the United States dirigible *Shenandoah* was torn to pieces in a storm in 1925, and that the therapeutic use of sulphanilamide was announced by the German chemist Domagk 10 years ago, in 1935.



Dayton Snyder

Production of a Machlett precision tube involves the bonding of glass and alloy rings placed on a mandrel.

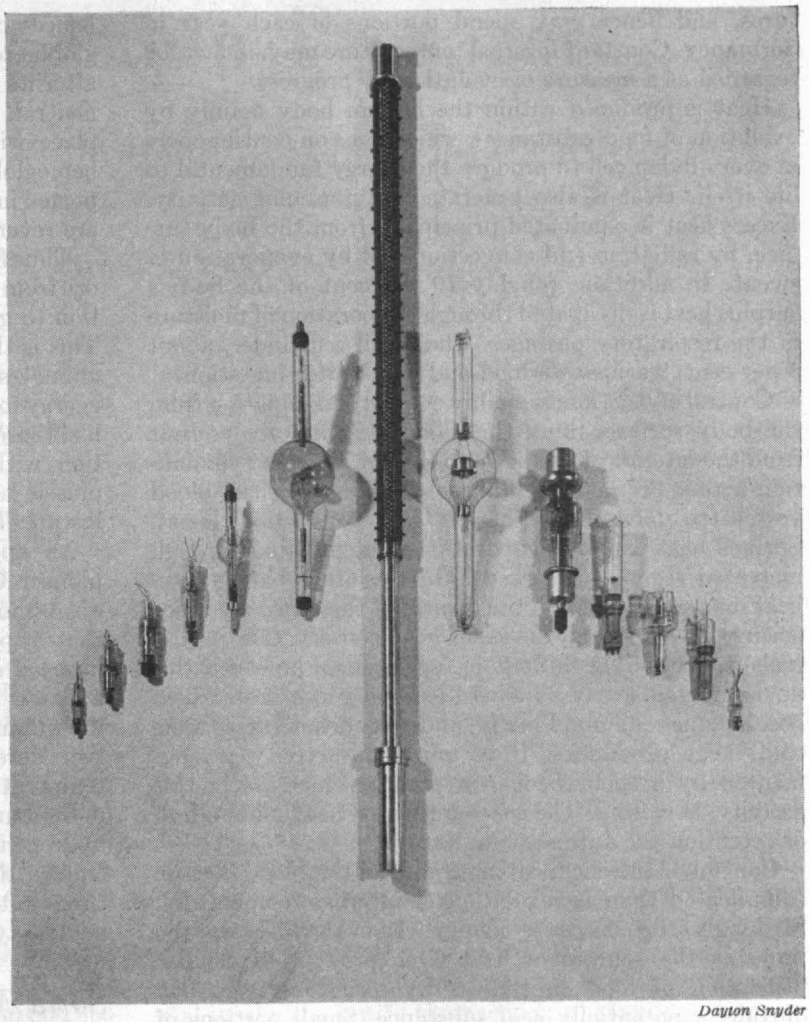
Bull's-Eye by X-Ray

By David O. Woodbury

INTO the well-known picture of extremely high-voltage x-ray production have recently come two new tubes built for precision and enormous penetrating power. One, designed to operate on a direct-current potential of 2,000,000 volts, has been developed by the Machlett Laboratories, Inc.; the other, designed for alternating current of similarly great voltage, has been produced by the General Electric Company. The Machlett direct-current tube was built for the High Voltage Laboratory of the Institute.

One of the major problems encountered in producing x-rays with very high voltages is that of confining the spot of impingement of electrons on the anode target to the smallest possible dimensions. If the electron beam diverges somewhat so that the spot is a quarter inch or so in diameter, as has usually been true, the x-rays struck off from the bombarded metal spread from an appreciable area, and vague edges on the shadow images in photographs result. Needed is a stream of x-rays emanating from a source as small as possible; hence the target spot affected by the electrons must be extremely small. The Machlett precision tube makes a notable advance in the attainment of this difficult requirement.

The method of focusing employed by the tube is somewhat analogous to that of an electron microscope. Essentially the tube is a 10-foot affair incorporating a five-foot column of metal and glass rings alternating with each other every half inch or so and sealed so perfectly that there are no leaks though the tube has 180 sections. Thus the interior can be exhausted and kept at a high vacuum for its entire life without an external pump; that is, the tube is sealed off like an ordinary radio tube. The cathode is a simple shielded tungsten filament. But at the anode end the target is something new — a disk of gold an inch and a quarter in diameter and a quarter of an inch thick. This gold also serves as the x-ray window, since the energy driven in line with the oncoming electrons passes through the gold and out at its farther side.



Dayton Snyder

A galaxy of x-ray tubes. Those at left and right of the precision tube are 35 and 38 inches long respectively.

The tube is designed for operation under several hundred pounds of air pressure to give high insulation. The metal rings distribute the electric field so that an essentially even gradient exists from top to bottom. A narrow electron beam with little divergence is thus formed. As the electrons near the end of their run, they pass through a magnetic field lens which concentrates them so sharply that the target spot is smaller than the period at the end of this sentence. The x-ray emanation generated by this onslaught shoots principally downward in a narrow cone, with most of the intensity in the forward direction. The combination of magnetic lens arrangement and high voltage gives an efficiency on the order of 5 per cent of the input energy.

This new weapon of the laboratory is an interesting example of what war necessity can do in applied technology. The average x-ray tube does not have more than two or three inches of metal-to-glass seals; this one has 300 feet, yet leaks give no trouble at all. The secret is in the method of building up the hollow column. This is done on a vertical revolving mandrel. A Pyrex glass ring and a Kovar alloy ring are laid one on top of the other on the mandrel, then heated with oxygen gas flames as they revolve, to give a rough joint. The area of contact of the two rings is thus filled with a thin layer of metallic oxide. When the bonding is good, the flames are turned off and the assembly is heated by a high-frequency coil which is lowered over it. The heating fuses the oxide layer and actually makes it flow into the glass so thoroughly that the molecules mingle and lock together. When this state has been reached all around the circumference and the pair of rings have been carefully centered, the mandrel is lowered slightly to bring them into an annealing chamber, the next pair of rings are added, and the fusing job is repeated. This process is continued until the whole tube is constructed.

Besides having applications in the war effort, the precision tube offers a tremendously powerful new means for further medical research, as well as an accurate source for x-ray photography both of tissues and of metals.

Heat and Acid versus Life

ALTHOUGH man thrives under great extremes of external environmental conditions, certain factors in his internal environment must always be kept in delicate balance, or death results. Most critical of these factors are his internal temperature and the chemical neutrality of his blood.

Man is a homoiothermic animal; that is, his internal temperature remains the same regardless of his surroundings. Fishes, amphibians, and reptiles, wrongly called cold blooded, are correctly termed poikilothermic, because their bodies assume the temperature of their environment. Were man poikilothermic, he probably could not have attained his present developmental peak, for animals lacking the homoiothermic mechanism become sluggish or totally inactive when exposed to low external tempera-

tures, and hence may spend portions of each year in dormancy. Constant internal temperature may, in fact, be regarded as a measure of evolutionary progress.

Heat is produced within the human body mainly by oxidation of food substances, which goes on continuously in every living cell to produce the energy fundamental to life itself. Heat is also generated by muscular activity. Excess heat is eliminated principally from the body surface, by radiation and convection and by evaporation of sweat. In addition, roughly 10 per cent of the body's surplus heat is dissipated through evaporation of moisture in the respiratory passages. The small remainder, about 5 per cent, warms cool food and drink after ingestion.

Control of heat loss is mainly control of dissipation from the body surface. Since the blood stream conveys heat from the interior of the body to the surface, heat elimination here is promoted by dilation of the superficial blood vessels to facilitate radiation and convection losses. Surface heat loss by evaporation is augmented through increased secretion of sweat. On the other hand, when heat must be conserved, the reverse of these two reactions occurs. An additional device of heat conservation in animals is erection, or fluffing, of fur. In man, however, this device remains only as a vestige, the goose flesh which accompanies chilling. Finally, under conditions of extreme cold, heat production from muscular activity is augmented by a spontaneous, involuntary increase in this activity, shivering. The mechanisms of heat elimination or retention are automatic in nature.

Control of the chemical neutrality of the blood is more complicated than is regulation of internal temperature. Strikingly, the sources of acidity within the body are the same as the sources of heat. One product of cellular utilization of food substances by oxidation is carbon dioxide, a potentially acid substance. Small portions of this latent acidity are at once offset by a reaction of the red coloring matter of the blood. This pigment transports oxygen from the lungs to the body tissues. When its oxygen-bearing form, oxyhemoglobin, releases oxygen, it becomes the slightly alkaline hemoglobin, thus immediately neutralizing some of the acidity produced by the very oxidation it makes possible.

Fortunately, another aspect of metabolism, the breakdown of food proteins, yields an end product which is alkaline. One step in this protein breakdown is deamination of amino acids, a process which generates ammonia. This ammonia thereupon combines with some of the oxidation-produced carbon dioxide to make the neutral substance urea. Urea is excreted through the kidneys.

But hemoglobin and deaminization together dispose of only a small portion of the oxidation-generated carbon dioxide. If the remainder were permitted to combine with the water of the blood, it would make carbonic acid. The acidity thus produced would, in short order, be fatal.

Carbonic acid in the blood would be a dangerous source of acidity because it is ionized — that is to say, in solution carbonic acid molecules dissociate into strongly acid hydrogen ions and but weakly alkaline carbonate ions. Clearly, if these hydrogen ions could be united to some substance which does not ionize but which remains in solution as whole molecules, the danger of lethal acidity would be eliminated. Such is precisely what occurs in the body. Protein molecules from the proteinaceous body fluids, and hemoglobin molecules from the blood, combine with hydrogen ions to form the little-dissociated, and hence not acid, hydrogen proteinate and hydrogen hemoglobinate. What remains of the carbonic acid molecule, after its hydrogen has been removed, is turned into near-neutral, innocuous bicarbonates. These changes take place within the tissues. The hydrogen proteinate and hemoglobinate and the bicarbonates are thence transported in the blood stream to the lungs. Here the reactions are reversed, and carbon dioxide is released and exhaled.

Thus four mechanisms are devoted to disposing of acidity from food oxidation But muscular activity, in addition to generating heat, also yields an acid end product. This is the lactic acid produced when glycogen, so-called animal starch, breaks down in the muscles to supply energy for muscular work. Hydrogen ions from this source, like those from carbonic acid, are disposed of by combination with protein molecules. However, in the case of muscle lactic acid, the other product of reaction is sodium lactate. This substance, like urea, is excreted in the urine.

An aphorism of physiology, first articulated by the pioneer Claude Bernard, is that "all the vital mechanisms, however varied they may be, have only one object, that of preserving constant the conditions of life in the internal environment." In the healthy human body, an average temperature of 98.6 degrees F. is at all times maintained, with an extreme diurnal fluctuation of but two degrees. In fever, 110 degrees may be approached, but temperatures in this high range are usually fatal. Furthermore, human life can exist only within a narrow range of hydrogen-ion concentration of the blood, close to neutrality. Regulation of this temperature is the function of three automatic vital mechanisms; the guarding of this neutrality depends upon no less than five.

Solid Mahogany

THE city of Zamboanga in the Philippines once had the distinction of being the only port in the world with a wharf built of rosewood. In the same tradition is a strip of plank road built by our Army engineers over a swampy section of a small Pacific island. "Mahogany Boulevard," the GI's call it, for it is constructed of solid mahogany. Neither the rosewood nor the mahogany was a reckless extravagance, for the only readily available structural timber happened to be of a variety which would be considered an exotic cabinet wood in Europe or America.

The wood for this road, and for many another military bridge, camp, railroad, telephone line, and so on, came from sawmills run by Army engineers and Navy Seabees right behind the fronts. With wood a prime military necessity and shipments slow and uncertain, our military forces have cut part of their supplies in Tunisia, Italy, Australia, and many south Pacific islands. Lumber from a camp in the Fiji Islands has been nailed into a building within four days of the time the tree was still standing.

Although sawmills have been improvised from abandoned gold mining equipment and similar odds and ends, the Army has a training center for its lumberjacks and can furnish them with a portable skid-mounted sawmill complete with heavy trucks and some of the more vital accessories for producing lumber. Native labor is also used, for some of the operations are conducted in areas where as much rain can fall in a week as falls in a year in many of the most humid sections of the United States. Without long acclimatization, our men cannot match the natives in endurance under such high heat and humidity.

The Magnesium Prospect

As the Light Metal Sheds Its Wartime Wraps, Future Utilization of the Greater Supply Comes under Study

By Arthur Lowery

I

THE opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or as reflecting the views of the War Department or of the Army at large.

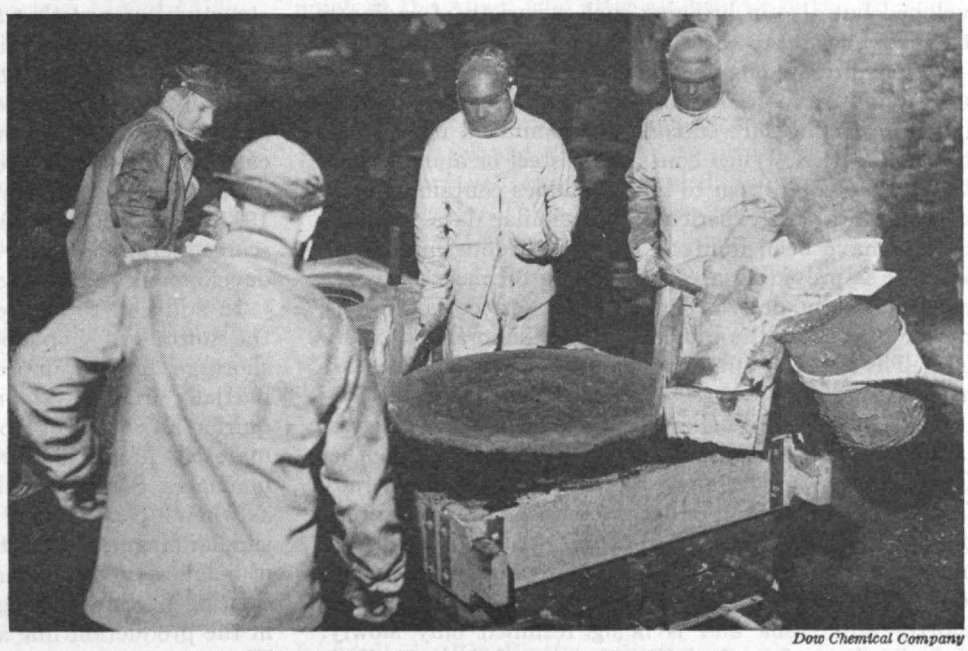
MAGNESIUM is shedding its wartime wraps. The second metal to be put under allocation by the Office of Production Management back in 1941, it is now the first to be relieved by the War Production Board of all specific controls, giving it greater freedom of action than any other common metal.

Military requirements for magnesium have decreased, and production in the government-owned plants has been either stopped or cut back. A surplus of over 100,000,000 pounds has been accumulated and continues to grow. Magnesium's story has attracted great attention and publicity. The discussion has been far from uniform, with widely divergent opinions on the history and on the future of the metal. Often the problems it involves have been exaggerated, but fully as often its future has been overglamourized. Estimates of annual magnesium consumption in the early postwar years are put by some prognosticators as low as 20,000,000 to 30,000,000 pounds and by others as high as 500,000,000 to 600,000,000 pounds. Exploring these various views is pertinent at this time, as is examination of some of the factors which must be considered.

Before the war the two centers of magnesium development in this country were the Dow Chemical Company and the American Magnesium Corporation, a subsidiary of the Aluminum Company of America. The other major activity was the German I. G. Farbenindustrie, from which the English producer, Magnesium Elektron, Ltd., received the basis for its operations. Much of the Germans' activity in magnesium stemmed from their drive for self-sufficiency. Along with most other countries, Germany had limitless raw materials for magnesium, and the German government encouraged and supported the use of it in place of imported materials, whether or not such substitution was economically justified. Through patent literature as well as personal visits, German practice was well known by both British and American firms up to the start of the war. The use of magnesium incendiary bombs by the Germans as well as their various applications of magnesium in aircraft was known to engineers here and in England, and caused no surprise when the war actually broke out. And during the war there has been continuous interchange of information and visits between American and British engineers, both on production of the metal and on fabricating practice.

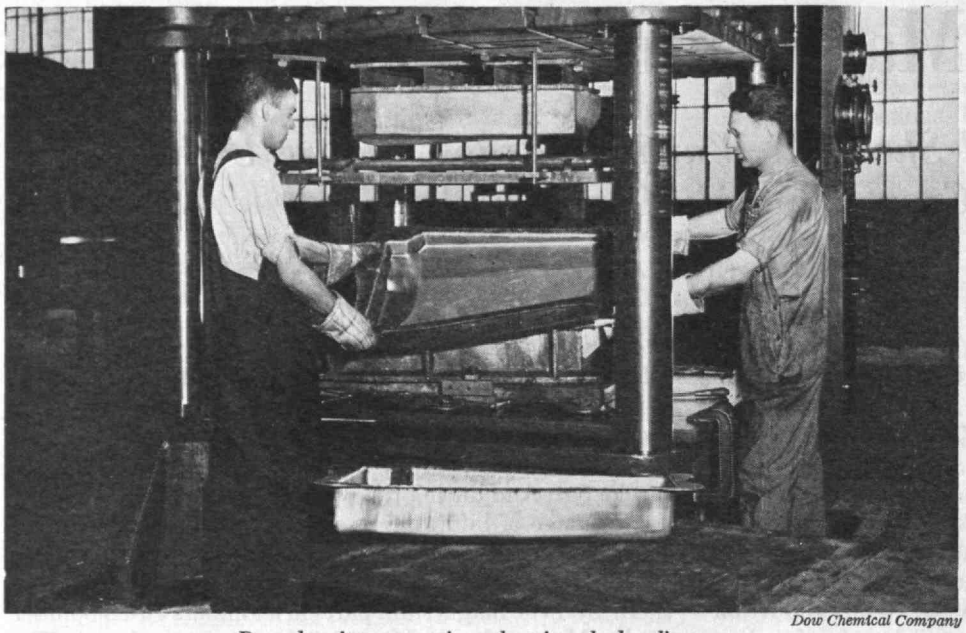
In 1941 the magnesium parts in a Junkers Ju-88 bomber and a Messerschmitt Me-110 fighter were analyzed. The conclusion was that our practices were generally equal or superior to German magnesium technology as exhibited in those aircraft, with the exception of their largest forgings. In this field it was a matter not of technique but of the capacity of available forging equipment. The Germans used forged magnesium engine bearers up to five or six feet in length, requiring forging presses of 10,000 to 20,000 tons' capacity. The Germans had built presses of this size as part of their extensive military industrial program, as had Russia, whereas in this country private industry apparently believed we had not yet developed either sufficient military demand or commercial market to justify the necessary heavy investment of private funds. The lack of this equipment has been recognized and is being corrected, as part of the current war production program.

Much technical progress in the production and fabrication of magnesium and its alloys has been made during the war and is immediately available for postwar use.



Dow Chemical Company

Pouring a magnesium casting in a sand mold



Dow Chemical Company

Deep-drawing magnesium sheet in a hydraulic press

Some new information has also been acquired. But the greatest progress has been made in the large-scale application of what formerly were laboratory techniques. Interchange of information between the old and the new producers and fabricators has been great. The Dow Chemical Company and the American Magnesium Corporation, especially, have received hundreds of delegations at their plants and sent engineers out into fabricating plants to help them over their early magnesium troubles. The aircraft companies have stepped up their investigations of magnesium possibilities, as have designers and builders of other military items. In addition to this private research, the armed services and the War Production Board together sponsored a series of some 20 investigations, conducted by the War Metallurgy Committee of the National Academy of Sciences, and participated in by the magnesium industry, the aircraft industry, and representatives of various technical organizations. These projects have been useful not only in the actual data developed but also in bringing such a variety of engineers together for joint research and interchange of information.

Many aircraft engineers who have been interested in magnesium have needed more design and service data on it before feeling sure enough to recommend it in a particular location. When considering steel or aluminum or brass, they could turn to large volumes containing engineering data and experience, but similar data for magnesium have been limited. The tremendous increase in war use is providing a corresponding increase in experience and data derived from actual service conditions, rather than from the previous limited laboratory experience. The effect is cumulative and will continue to increase after the war.

There is reason to believe we have made more progress in magnesium applications during the war than has either Great Britain or Germany, and that we are now generally farther advanced than either, in spite of the widespread popular impression to the contrary. Largely because of man-power limitations, development work in England looking toward new applications was practically stopped shortly after 1939 and is being resumed only slowly. Examinations of crashed German aircraft indicate little increase in German use of magnesium parts during the war. A British engineer, writing in *Magnesium Review and Abstracts* for April, 1944, says: "The present war has brought about important changes in the production position, although in this country [Great Britain] and in Germany there seems to have been relatively little change from the point of view of widened applications. . . . In the United States the 'Use Magnesium' campaign has been in progress longer than it has here, and this, combined with the generally more 'adventurous' policy of American engineering firms, has led to magnesium applications which are not known in this country."

One bottleneck of technique remains. Metal-working shops qualified to design and make finished products or components out of magnesium sheet, castings, forgings, and other semifabricated forms are not yet plentiful. A number of aircraft and other military applications for magnesium have been postponed at various times because qualified design engineers were not immediately available. The forming and assembly of magnesium components are different from the working of aluminum, just as both are different from steel or from brass. Experienced producers are helping new shops get started, and the old shops are expanding, but progress should not be pushed too fast. When new applications for the metal are attempted unsuccessfully, through either ignorance or carelessness on the part of the designer and fabricator, a customer prejudice may be set up which will require years to overcome. Moreover, the sudden demand for incendiary-bomb alloy was so great in 1941 and 1942 that there was little magnesium left in the United States for developing new aircraft or other military structural uses at that time. In 1943 the supply became freer, the emphasis on lightweight construction increased, and many developments got under way. However, progress in the structural use of magnesium possibly would be farther advanced now if a more plentiful supply of fabricated products had been available to aircraft engineers during the fluid design period of 1941, 1942, and early 1943. Since then engineering man-hours have become scarce, permitting only the more urgent combat-dictated developments to be engineered.

In addition to the scarcity of engineering time came the shortage of shop labor in the aircraft industry. As this shortage became more critical and emphasis shifted partially from development to production, changes requiring retraining of labor or temporary readjustments of material processing were discouraged by production managers. Sometimes this situation favored magnesium, as when a complicated structure might be replaced by a simpler magnesium part, but more often the development of magnesium was retarded. Certain companies replaced existing parts with magnesium if no change was caused in the production line as a result of such a substitution. The prospective users of (*Continued on page 186*)

Notes on Weapons

V-2, V-1, Me-163, among Recent Additions to the Alphabet of War, Offer a Varied Story

By Willy Ley

THE German V-2, unique because it was announced by the Nazis a full year before it was put into action, is a rocket on a truly titanic scale. Thus it rightly takes first place in any notes on recent additions to the implementation of war. Its war head is the same as that carried by V-1, namely, a container holding 1,000 kilograms — approximately 2,200 pounds — of high explosive. The rocket itself is powered by liquid oxygen and either alcohol or gasoline, fed into the combustion chamber by means of a fuel pump of novel design. Official British reports describe four right-angled stabilizing fins mounted at the rear of the rocket. Others have mentioned exhaust jets designed to impart spin to the rocket in order to stabilize it. The total weight of the rocket without fuel, but including the war head, is close to two tons. The take-off weight is between 12 and 15 tons, so that the fuel and oxygen load amounts to over 10 tons. If the fuel used is alcohol, the amount of liquid oxygen carried (assuming a total fuel weight of 12 tons) is about eight tons. If the fuel is gasoline, the amount of liquid oxygen carried must be over nine tons.

A rocket with a mass ratio — the ratio of the weight of fuels to the dead weight of the rocket — of about 6.5 to 1 can be expected to travel over 200 miles if the exhaust velocity is around two kilometers a second, which is a reasonable experimental value for the fuels mentioned. This theoretical range agrees closely with the figures lately released by the Nazis and also with actual observations: V-2 has a maximum range of about 300 miles and, in order to achieve this maximum range, attains a peak altitude of about 70 miles along the trajectory, assuming that it is fired at an elevation of between 45 and 55 degrees.

The military value of this weapon is small. Prime Minister Churchill stated that V-2 rockets landed "at widely scattered points" in England. This is just what one would expect from fire over a range exceeding 200 miles, no matter whether it is gunfire or rocket fire. Chances are, of course, that rocket fire would be still less accurate than gunfire, provided the latter could be accomplished at all.

Not only that any hit scored by a V-2 is purely accidental and completely unpredictable — the effect of the one-ton war head is actually less than that of the same war head when attached to the V-1, or robot bomb. When attached to a V-1, the war head hits the ground at a relatively slow velocity, so that the blast is effective laterally for quite some distance. When attached to a V-2, crashing with an extremely high velocity (some estimates are close to 3,000 miles an hour) from a height of 70 miles, the war head buries itself in the ground before exploding. The effect is, consequently, the same as that produced by shells from heavy siege artillery: high penetration but little lateral damage.

V-2, therefore, can be characterized as an extraordinary example of engineering and research but also as a military flop. The first military demand on any shooting weapon is high, or at least reasonable, accuracy. V-2 lacks accuracy completely; it is not even capable of hitting such a target as a whole city when fired at extreme range.

The same judgment applies when future development is considered. Unless one wants to assume a completely new invention, based on hitherto unknown principles, which would presumably enable the rocket gunners to hit an acre over any given range, long-range rockets of the type of V-2 will always have to be considered as terror weapons. The most likely "improvements" to be anticipated can all be expressed by the one word, "enlargement." This enlargement may either be used to carry heavier war heads over the same range as V-2 does now, or it may be used to carry the present weight of war head over a longer range. In either case the weapon would be capable only of accidental hits, and an enormous expenditure of matériel would be required for it to "cover" the target area thoroughly.

As long as antiaircraft devices have not reached a point of development which makes bombing raids absolutely impossible, the bombing raid will be far superior to a long-range rocket attack both in weight of high explosive carried and in accuracy of placing it. It is obvious that the Nazis themselves regard V-2 mostly as a terror and propaganda weapon, preceding their use of it by extensive publicity and accompanying their use of it with an even more voluminous and concentrated propaganda barrage. And this propaganda seems to be aimed not so much at the Allies, who after all experience the extreme haphazardness of the weapon, but at the Germans themselves.

Doctor Goebbels is merely following a pattern set by the Imperial German propaganda agencies during World War I. In March and April, 1918, the world was agog with the news that the Germans were shelling Paris from a distance of 80 miles. These projectiles, incidentally, rose to a height of 28 miles during their 99-second trip, establishing at that time an altitude record for man-made things which remained unbroken until V-2 appeared. The shells, roughly of eight inches caliber and weighing 256 pounds apiece, were fired with a muzzle velocity of almost precisely one mile a second from the 100-foot barrel of the German long-range gun hidden in the forest of Crépy. The official German name for this piece was *Kaiser Wilhelm Geschütz* (*Geschütz* means "piece of ordnance," applied to artillery only) and the official designation was *lange 22.2 cm Kanone im Schiessgerüst* (the "long 222-millimeter cannon in the shooting cradle"), but the Germans usually referred to it as *die Pariserin* (*la Parisienne*). The name of "Big Bertha" is merely a silly mistake perpetuated by lay writers. Big Bertha actually was the German 42-

centimeter siege howitzer which fired 1,800-pound projectiles with high accuracy over a maximum range of 9½ miles.

During a few months of operation the Paris Gun fired over 300 rounds into the city, overshooting by as much as four miles and undershooting by as much as 16 miles, killing about 280 people, and destroying one church and a few score of private houses. This result hardly warranted the estimated $50,000,000 of expense for the gun and the rather large diversions of materials and man power for its sake.

By August, 1918, the Paris Gun could no longer be used, because Paris was out of range. By November of the same year the German army collapsed. Its leaders had known that the war was lost long before the Paris Gun was even shipped to the forest of Crépy. After the German revolution the German socialists voiced their opinion about the gun by saying that "the shot to Paris was meant as a shot in the arm for the German army." They called it *die grosse Morphiumspritze* ("the big morphine needle").

The parallels between the Paris Gun and V-2 are amazing: In both, we have a long-range weapon of unheard-of dimensions and performance. In both, we have masterpieces of design and engineering, far ahead of other similar attempts of the same periods, but both military flops and mere terror weapons. And in both the intent is clearly visible: *die grosse Morphiumspritze.*

But whereas the Paris Gun was otherwise useless, V-2 might have its uses. A rocket which can carry a one-ton war head to 70 miles when fired at an angle, can be expected to carry 250 pounds of observer and instruments to over 200 miles when fired vertically. V-2 is not much of a weapon with which to win wars and influence enemies, yet history may say later that V-2 was the first space ship.

The Future of V-1

The German V-1, the jet-propelled winged bomb, usually referred to as "robot bomb" or "robomb," which was first used by the Germans against London 10 days after the Allied invasion of northern France, seems to be assured of a permanent place in the arsenals of the world.

Robot bombs are to be produced in large quantities in the United States for the Allies. The dimensions of the American flying bombs are a military secret; it has been stated that they will resemble the German original in general outline, being torpedo shaped and equipped with one pair of wings and tail stabilizers and a jet motor mounted on top of the fuselage. (The German robot bomb is about 22 feet long; has a wingspread of 16 feet, a speed of about 350 miles an hour, and a range of about 150 miles; carries a war head with 1,000 kilograms of high explosive; and consumes about one gallon of fuel for every mile of flight.)

Weapons of the type of V-1 may be regarded essentially as aerial equivalents of the naval torpedo. Just as the naval torpedo is a self-propelled, explosive-laden, and automatically controlled model submarine, so the robot bomb is a self-propelled, explosive-laden, and independent model airplane, kept on course by an automatic steering device. It makes no difference whether the power plant is a jet motor, as in the German V-1 and its American equivalent, or an ordinary airplane engine, as in the American experimental models of 1918 which had a range of 400 miles but came too late to be used in World War I.

There can be no doubt that the German V-1 failed to live up to the expectations of its designers and of the nazi military. Quite a number of things were, and still are, wrong with it. Yet there can be no question that the robot bomb has possibilities. The deficiencies are the following:

Lack of accuracy. Even when not intercepted by antiaircraft fire from the ground or by intercepter airplanes, the robot bombs showed a variation in range of more than 10 per cent of the total range. This classified them automatically as an area weapon with which the destruction of a specific target could not be attempted except by such enormous expenditure of flying bombs that a chance hit on the specific target became probable.

Poor performance. During an 80 days' bombardment, only 2,300 out of 8,000 V-1's reached London, less than 30 per cent of the total. Forty-six per cent were brought down by antiaircraft fire, balloon barrages, or aerial interception, while a full 25 per cent, one out of every four, proved to be erratic. Reports from civilians in the then occupied countries indicate that a large number of flying bombs crashed just outside their launching platforms. The percentage of erratic missiles, therefore, is probably higher than 25 per cent, the figure reported by British observers.

Unsatisfactory design. The intermittent jet motor used by the Germans for their flying bombs does not work when at rest. This fact necessitated additional means for imparting an initial velocity to the robombs so that the jet motors would start working. The many crashes near the take-off ramps were probably due to poor functioning of the system used to impart the speed required both for aerodynamical effectiveness (the flying bombs have an unusually high wing loading) and for the operation of the motor.

Interceptibility. Naturally a winged bomb, flying at a given height and in a straight line, was highly vulnerable to interception. The only things which made interception difficult were the small size of the target (this difficulty mainly handicapped antiaircraft gunfire from the ground) and the high speed of the flying bombs. Many of the fighters used had to be dived in order to attain the same speed. Fast fighter types had a comparatively easy job, and one Polish pilot invented the method of ranging alongside and getting his wing tip under the wing of the flying bomb. By flipping it over on its back, he made it crash. This method was much used afterward.

Some of these deficiencies are inherent in the type; others might be avoided by changes in design. Not very much can be done about accuracy over a range of 100 miles or more, unless the bombs should be equipped with a wing-shedding device operated (by radio) from observing planes which, while not able actually to guide the flying bombs, could make them crash in the proper places.

The poor performance, however, could be largely avoided by more careful design and better workmanship. The main design change, obviously, would be one substituting a jet motor or airplane engine which can work when at rest, so that the need for take-off help would be obviated. This would also eliminate the long, expensive, and in any event cumbersome launching ramps which can easily be spotted from the air in spite of camouflage. Flying bombs capable of taking off from any airdrome runway or even from a straight section of a road would be much more adaptable, especially to a war of movement. And because they would not need (*Continued on page 182*)

Microbes That Work for Man

Micro-organisms Perform Increasingly Useful Industrial Service As Scavengers, Laborers, Analysts, Chemists

By Frederic W. Nordsiek

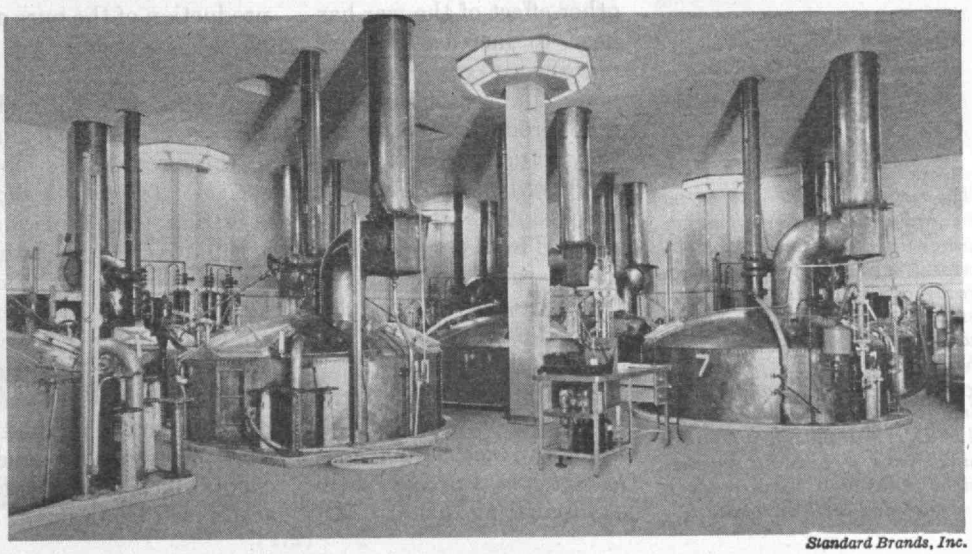
IN RECENT times, while beasts of burden such as the horse were being largely replaced by machines, another group of living organisms which serve mankind have been vigorously on the ascendant. These are the micro-organisms — the yeasts, bacteria, molds, and protozoa — which do service in roles that may be characterized so diversely as those of scavenger, laborer, analyst, and chemist. One single type of microbe, the yeasts, may in fact be shown in each of these varied capacities.

Although other micro-organisms are more important in scavenger applications, yeast occasionally is added to cesspools or septic tanks to encourage the fermentation desirable in them. When yeast leavens bread, it merely performs labor, for the gas it generates serves only to expand the rising dough, and later dissipates. Yeast today also serves in the capacity of analyst in the widely used fermentometer for accurate quantitative determination of thiamin, or vitamin B_1. In this apparatus the substance being tested is the sole source of thiamin in a medium in which yeast is grown; under these conditions the volume of gas evolved is a measure of the thiamin present. Finally, in the important industrial production of ethyl alcohol by fermentation of molasses, grain mashes, or other cheaply available carbohydrates, yeast serves as a chemist, breaking down the complex carbohydrate molecule to liberate carbon dioxide gas and produce the two-carbon molecule of ethanol. The making of ethyl alcohol by yeast typifies the industrial fermentations, the field of microbial utility which is the subject of this article.

Bacteria and yeasts are unicellular plants. Molds likewise are primitive microscopic plants but exceed one cell in size and show some differentiation of tissues. Protozoa have little usefulness in industrial fermentations, although they are valuable in the scavenger capacity in the activated sludge process, one of the most modern developments in sewage disposal, presently used by leading cities. Before turning to some timely general considerations basic to all of the industrial fermentations, let us look at the salient features of representative processes dependent upon yeasts, bacteria, and molds respectively.

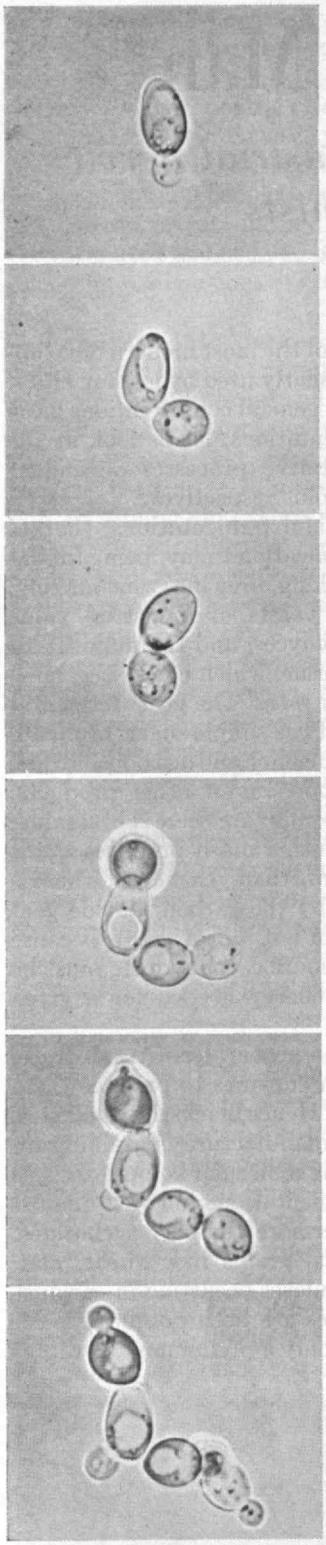
The most venerable of useful fermentations, that of yeast, is the one of widest application today, being fundamental to the industries of baking, brewing, wine making, and distilling. Most of the yeasts of industrial value belong to the genus Saccharomyces, and the majority of these are of the species cerevisiae, which comprises, however, many different strains or races. The yeast fermentation is primarily conversion of the simple sugar, or monosaccharide glucose, to ethyl alcohol and carbon dioxide, with varying but small proportions of other products. Two broad types of end results are here obtainable: Forced aeration of the fermenting mash produces a low yield of alcohol but a heavy growth of yeast cells, whereas partial anaerobiosis, created by the carbon dioxide generated, results in much alcohol but in less yeast, because under these latter conditions more carbohydrate must be broken down to release the energy needed for a given amount of yeast growth.

While yeast requires the monosaccharides in its substrate, it is able by means of its own enzymes to produce them from the more complex sugars. Hence blackstrap molasses, a by-product of cane sugar manufacture containing an assortment of sugars of varying molecular complexities, is a good substrate for yeast fermentation, and vast quantities of it are so used. Furthermore the polysaccharides, such as the starches of cereal grains like wheat, and, finally, the more complex celluloses occurring in sawdust and in similar cellulosic wastes are both potential mash materials for yeast, requiring only a preliminary hydroly-



The scale of fermentation industries may be visualized from this top view of fermenters in a yeast plant. Fermenters are tanks in which micro-organisms are grown in pure culture in suitable substrates for the purpose of converting the carbohydrate of the substrates to the desired end product. The fermenters shown here extend two stories below the floor; individual capacities are as large as 60,000 gallons. A typical plant has 16 such fermenters, with a combined capacity of over 400,000 gallons.

Standard Brands, Inc.



Fleischmann Laboratories

The usefulness of micro-organisms in industrial fermentations depends upon their intense activity, a result of simple life requirements, ready ability to attack food substrates, and rapidity of reproduction. This latter characteristic is here illustrated by photomicrographs of yeast, taken at half-hour intervals at a magnification of 1,500X. Within three hours a single yeast, by budding, generates eight individuals, each ready to detach and carry on adult life.

sis to the stage of sugars, whence their molecular simplification may be continued by the yeast enzymes. Starches of cereal origin are used in brewing, in the making of whiskies, and, in nonwar times, to a minor extent in the production of industrial alcohol. The preliminary breakdown of the starch is accomplished either by the enzyme diastase, which is derived from malt, or by a hydrolysis using mineral acids, high temperatures, and high pressures. This latter method is also the one used for hydrolyzing cellulosic materials to prepare them for yeast fermentation.

War-occasioned shortages of conventional raw materials and war-distorted demand for end products, in the present as in the last World War, have brought to the fore processes in the industrial fermentation field which otherwise would be unimportant. Typical of these is the use as a yeast substrate of waste sulphite liquor from the wood-pulp paper industry. By the neutralizing of this liquor and by the special training of a culture of yeast to ferment it, satisfactory yields of alcohol are obtained. Recent reports from Sweden indicate that sulphite liquor is there being widely utilized to grow yeast for human food. Another effect of the war has been to increase the importance of grains as raw material in industrial alcohol production — in 1943 they actually were the major raw material for this process. This change has resulted from wartime shipping hazards, which for a time virtually stopped the supply of molasses.

Typical of the bacterial fermentations is the production of acetone and butanol by *Clostridium acetobutylicum*, a process with a fascinating history. It illustrates further the profound influence of wars upon industry and also shows how, with one particular industry, by-products may successively become primary products while those of erstwhile major importance correspondingly retrogress. Preparation of the substrate for this fermentation involves grinding degermed corn, cooking it under pressure, and then cooling this mash before inoculating with cultures of the Clostridium. The crude spirit, which is separated from the mash by distillation after fermentation is complete, comprises roughly 60 per cent butanol, 30 per cent acetone, and 10 per cent ethanol. These are readily segregated by subsequent fractional distillation.

This process was initiated commercially during the first World War, when acetone was in demand by the airplane industry and also for manufacture of the explosive cordite. At that time the government of this country operated two acetone-butanol plants, but after the end of the War the outlet for acetone, then the useful product, dwindled to the extent that these plants were closed. Not long after, however, developments in lacquers for the automobile industry required large amounts of butanol. The fermentation process was thereupon revived, butanol becoming the primary product and acetone a by-product. Later, as the nutritional significance of the vitamins became established, a modification of the acetone-butanol process was developed to produce a concentrate rich in riboflavin, or vitamin B_2. This was a timely discovery, for there shortly ensued a period when the demand for riboflavin kept well ahead of the supply of the synthetic vitamin. Then this natural riboflavin concentrate produced by *Clostridium acetobutylicum* enjoyed a ready market, particularly since it could be offered at a price which on the basis of riboflavin potency was considerably lower than was at that time commanded by the synthetic vitamin. Thus for the second time in what is essentially the same process a minor product, or one unrecognized and undeveloped, became a product of major value.

Although the yeast fermentations are numerically few — only one, the production of glycerol, being noteworthy other than the alcoholic fermentation previously touched on — there are a number of valuable bacterial fermentations. The end products of these, in addition to the acetone, butanol, and ethanol already mentioned, include isopropyl alcohol, acetic acid, lactic acid, propionic acid, butylene glycol, and *l*-sorbose. Acetic acid production by bacteria is the basis of vinegar manufacture, and the bacterial lactic acid fermentation not only is used for production of the pure acid but also is fundamental to the pickle, sauerkraut, and cheese industries as well as to the making of silage.

A representative mold fermentation is the making of citric acid. Although a number of different molds are used in this process, the most productive of these is a black species, *Aspergillus niger*. Sugars are required for the substrate; cane sugar and commercial glucose or corn syrup are considered the best, but maltose and molasses may also be used. The small amounts of sugars remaining in the substrate after the mold has completed its growth are customarily removed by being fermented with yeast before the citric acid is crystallized out. Thus one type of microbial fermentation becomes accessory to another. Similarly in the production of vinegar from cider or other fruit juices, yeast converts the sugars of the juice to alcohol, which subsequently is oxidized to acetic acid by the acetic acid bacteria. (*Continued on page 196*)

Railroad Comfort and Patent Furniture

Metamorphosis, Not Mimicry, Is the Mark of the Able Answer to Problems of Convertibility

By Sigfried Giedion

III

A FEW years after his litigation with Theodore T. Woodruff, George M. Pullman lost his franchise over the very line on which the *Pioneer* had first run. Not even Pullman could always escape humiliation: In those merciless years, that man would come out on top who fought with financial power on his side. To Cornelius Vanderbilt fell the satisfaction of opening this line to the sleeping cars of a company which was financed by himself. This was Webster Wagner's Palace Car Company.[1,*]

Structural resemblances link the careers of George M. Pullman and of the great packers Philip Armour and Gustavus Swift. They all belonged to a generation born in the Thirties. They all left the eastern states for Chicago, to find there the field for unlimited enterprise. Pullman and his idea of comfort in travel, Swift with his successful operation of the refrigerator car, conquered the dimensions of the land.

In both lived the same urge to expand in breadth as in depth: horizontally toward monopoly and vertically by expansion into anything that might be linked with their basic concern. The great meat packers processed the cattle, assured transportation in their own cars, created a nation-wide marketing organization, and built up industries to exploit the by-products. In the same way Pullman ran his cars wherever he could force an opening. He bought out every competitor but one, the company controlled by Vanderbilt. Two years after Pullman's death, however, the New York Central system, on which Vanderbilt had run the Wagner cars, was also brought in; the Pullman monopoly of first-class service was complete. Vertically, Pullman expanded by constantly lengthening his list of manufactures. He built not only his own types but also anything connected with rolling stock.

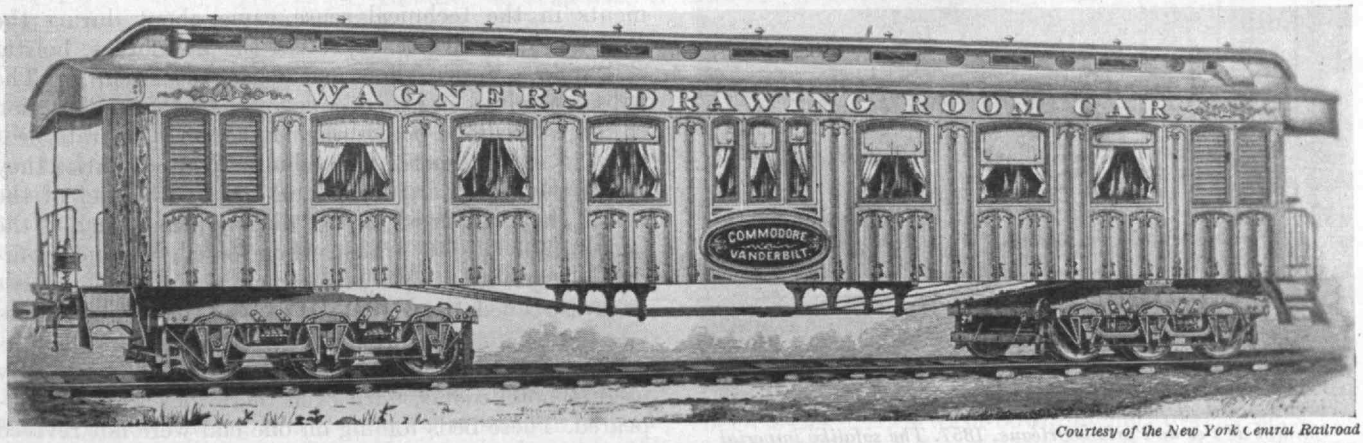
* Footnote references will be found on page 206.

The Extension of Travel Comfort: Dining Car and Parlor Car

In the late Fifties, dining cars were for potentates only. Napoleon III and his imperial staff banqueted at a large central table which was attended by liveried servants (Fig. 3).

The dining car began as an old baggage car into which had been moved a lunch counter, together with some high stools. "The diner of 1862 was a baggage car . . . and bare as to the interior except that it was furnished in the middle with an oblong counter around the four sides of which the patrons ate while sitting on high stools. . . . From the inside of this oblong the viands were served by colored waiters in white jackets." [2] Pullman's touch changed the dining car as it had changed the sleeping car; he opened it to comfort.

When Pullman secured his dining car patents in 1869,[3] he was not specially keen for new inventions. What he claimed was a particular arrangement and combination. Still uncertain of the trend, he patented two distinct combinations. Could he risk a dining car having no sleeping accommodation, or was it advisable to unite both facilities into a single type? The "hotel-car" of 1869 (Fig. 4, top) is still a sleeping car with a small kitchen built in at one end. The details are not specified. It was the type, the combination, that Pullman was anxious to protect. This hotel car was interesting for a further reason: "My improvements are designed to provide a convenient car in which passengers, and especially families, may ride, eat, and sleep." The other end of the car held the privileged, segregated cabins. These Pullman described in detail and referred to as "state-rooms." Only a narrow passageway led around them; the common aisle was done away with. They were for the traveler who desired privacy. It was the first appearance in America of a preferred section set



Courtesy of the New York Central Railroad

Fig. 1. Webster Wagner's early drawing-room car. Running on Vanderbilt's network, the first drawing-room (parlor) car was introduced by Webster Wagner in 1867. Whether the car illustrated is the actual one put in service in that year could not be ascertained.

apart within the car. It meant further differentiation in favor of a class system.

His other combination (Fig. 4, below), the "improved dining-car . . . intended to be used as a travelling dining-saloon and restaurant," forewent sleeping accommodations altogether, but the sleeping car still dominated its pattern, as Pullman himself allowed: "The seats are arranged transversely, and so as to face each other, as in the sections of a sleeping-car." Still lacking were the chairs that Napoleon had in his dining car of 1857. The table was moved to the seats, not the seats to the table, "one end of which is supported by a leg . . . while the other end is hooked into sockets . . . so as to be readily detachable." The dwelling house was still at the back of Pullman's mind. He sank the provision room like a cellar beneath the floor of the car; there were china closets between the windows and a large water tank above the kitchen.

Napoleon III had his *wagon d'honneur* in which to hold receptions. Divans lined its walls as in fashionable drawing rooms of the Second Empire. For the ruler there was reserved a seat of honor, sofalike, and set apart (Fig. 2). Viollet-le-Duc, who designed the train for the Paris and Orléans railway company, imparted to this seat something of his delicate romanticism. These *wagons d'honneur* became drawing-room cars for everyone in America 10 years later (1867), when Vanderbilt's protégé Wagner gave them to the public (Fig. 1), though whether the drawing-room car of our illustration represents the actual model of 1867 is not certain. George M. Pullman's first drawing-room car dates from 1875. In it were no divans along the wall, no stiff and upright seat of honor; instead, there were a number of equally comfortable swivel chairs with adjustable backs in which one could pivot with ease. Comfort was rapidly growing. Soon the movable footrests already projected in the Fifties came into use, together with the various amenities of the patent-furniture movement, then reaching its fullest extent. The simple, concise

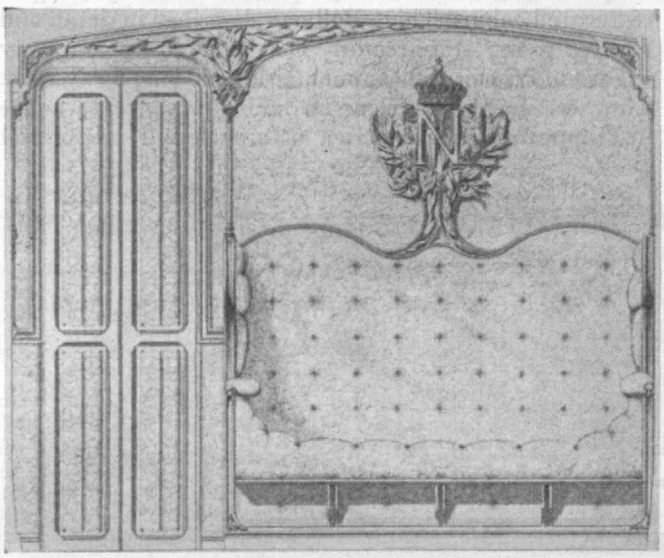
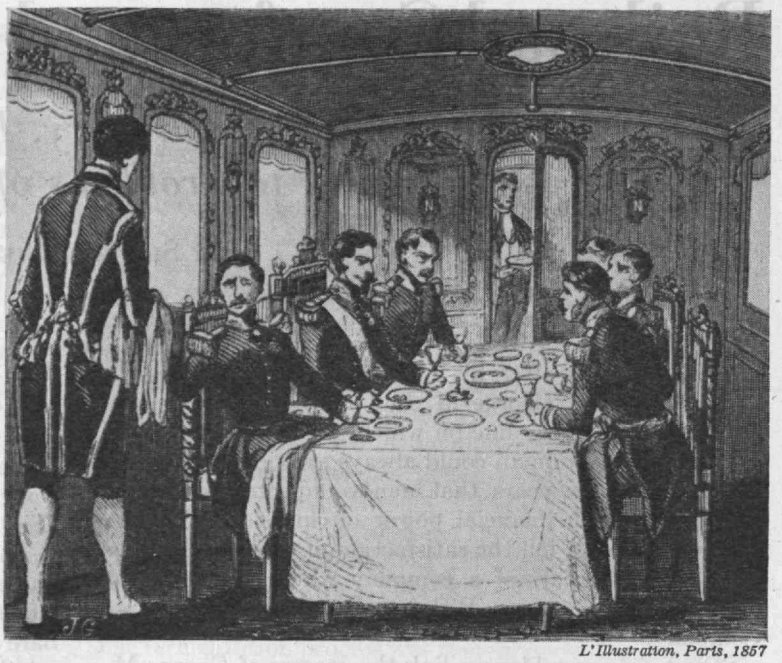


Fig. 2. Seat of honor in Napoleon III's "Train Impérial," Chemin de Fer de Paris à Orléans, 1857. The sofalike imperial seat in the wagon d'honneur *was designed by the distinguished architect, Viollet-le-Duc, who decorated the whole train.*



L'Illustration, Paris, 1857

Fig. 3. Napoleon III's "dining-room" car, 1857. In the Fifties, dining cars were for none but potentates. The Emperor is presiding over a large table placed in the center of the space. Around it, liveried attendants serve the ruler and his suite.

lines of the adjustable swivel armchairs of 1875 were the logical result of obedience to function. No William Morris was needed to purify their design. As we have mentioned, from 1893[4] onward the appointments and the ceiling became increasingly exuberant, and one realizes what detours had to be threaded before there could be any return to forms better suited to purpose. The parlor-car chairs of 1875 were as far from the exuberant ornamentation of the Nineties as from our own "streamline" designs.

Combinations and Mimicry

Beds that swing vertically or horizontally away, beds folding upward or upon themselves — the most variegated methods have been tried for saving daytime space in dwellings. We are thus led into the domain of convertible beds which may assume the shape of other furniture by day or may disappear into the wall and even into the ceiling. In the earlier stages the process involved no more than folding the bed to the wall and sometimes sheathing it in a case. These practices go back in part to the Seventeenth and Eighteenth centuries.[5] Improvements in the technical sense came about during the 1830's. Simple devices "protect the bedclothes, bolster and pillows from falling out when turned up."[6] The patent-furniture era spent much care on the construction of these wardrobe beds, which replaced a separate bedroom in many American dwellings. In the Eighties they found their standard form, and toward the end of the period they were made as real display pieces, such as the bed of 1891 (Fig. 6) which, when folded, became a mirrored wardrobe of "richly figured mahogany." These beds were also called "parlor bedsteads," for they were to stand in a parlor, not in a bedchamber. In later years they became quite rare in private houses, although frequently used in hotel rooms, until even there they slowly disappeared. These beds folding on one end were not revived until many years later, when the Pullman Company, in 1937, brought out its roomette cars (Fig. 7).

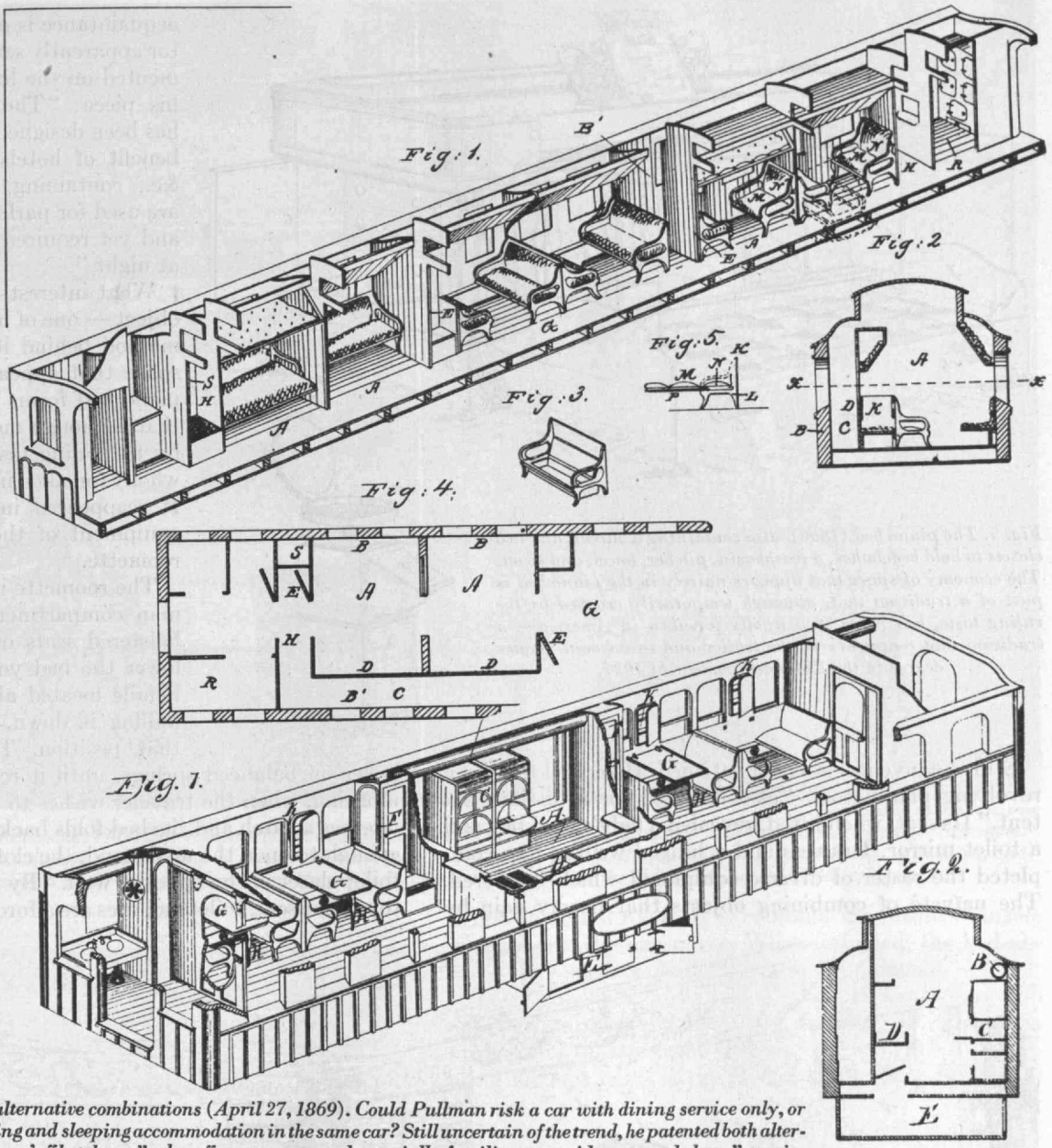


Fig. 4. Pullman's alternative combinations (April 27, 1869). Could Pullman risk a car with dining service only, or should he unite dining and sleeping accommodation in the same car? Still uncertain of the trend, he patented both alternatives. Top. *Pullman's "hotel-car," where "passengers, and especially families, may ride, eat, and sleep," carries at one end a small kitchen, "R." This, incidentally, is, to our knowledge, the first appearance in America of privileged sections—"state-rooms," indicated by "A," which are by-passed by a narrow passageway, "C." The chairs, "K," could be "free to move about the room."* Below. *Pullman's "improved dining-car" is already without sleeping accommodation. "The seats are arranged transversely . . . as in the sections of a sleeping-car." Unlike the individual seats of Napoleon's "dining room" of 1857, the seats here are fixed and the table is movable. The kitchen occupies the center of the car; it is still reminiscent of the domestic type, having its provision room and icebox, like a cellar, below floor level. "D" is the sink, "C" the range, "B" the water tank.*

Few pieces so preoccupied the inventors between 1850 and 1890 as the bed that would convert into some other object. Furniture was used dummy fashion, as envelopes for beds, in numerous ways. It is a widely ramified but none too satisfactory field, for in most cases it means not metamorphosis so much as mimicry. A bed that becomes a sofa for day use justly serves its double purpose: It is a sofa and it is a bed. It changes not merely its appearance but its nature: metamorphosis. But a bed that assumes, for instance, the guise of a piano, attempts to pass for something that it is not. This is mimicry.[7] Here the ruling taste and the constituent furniture of the Nineteenth Century met, leading to a cleavage that sometimes bordered on the ludicrous. Here historians who like the grotesque will find abundance of rich material.

At the outstart problems of convertibility were tackled in full earnest. New, almost incredible, combinations were thought up. Thus one inventor (1866) constructed a piano combined with an almost complete bedroom set (Fig. 5), and he reassured: "It has been found by actual use that this addition to a piano-forte does not in the least impair its qualities as a musical instrument."[8] This combination was achieved in the simplest way, by the use of the vacant space under the body of the piano, which, "instead of resting upon the customary legs, is supported by a frame, B. . . . The frame B is so arranged as to contain a bureau, E, and two closets, F and G . . . to hold the bed-clothes . . . a wash-bowl, pitcher, towels, &c." The bed filled a sort of gigantic drawer in the frame supporting the combination, and was drawn out by two handles.

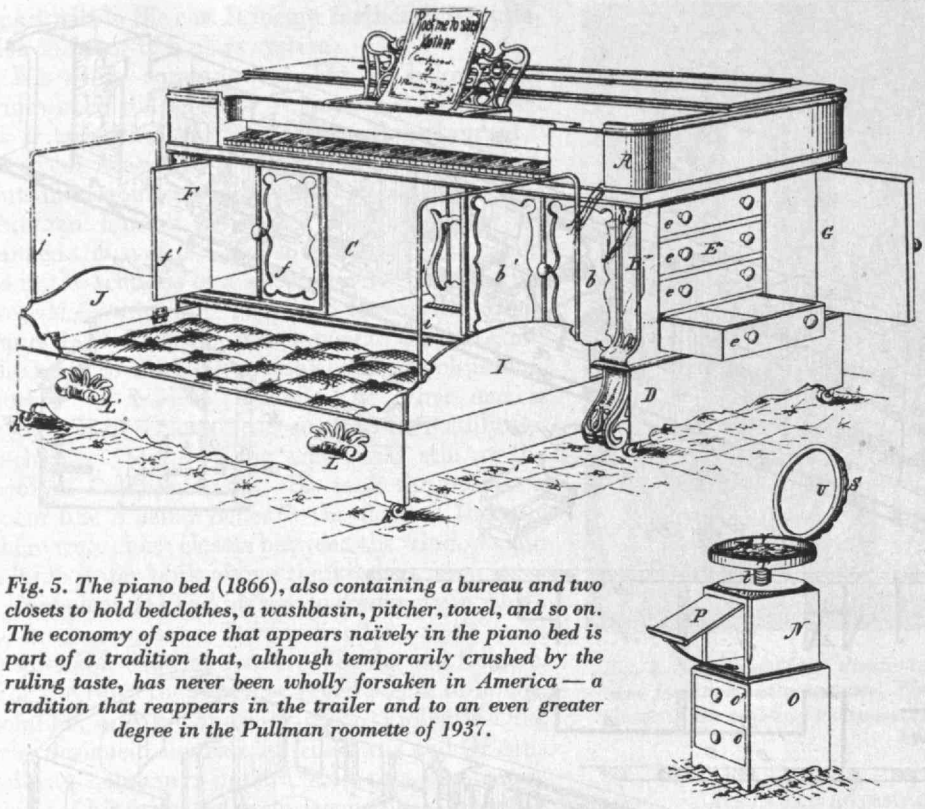


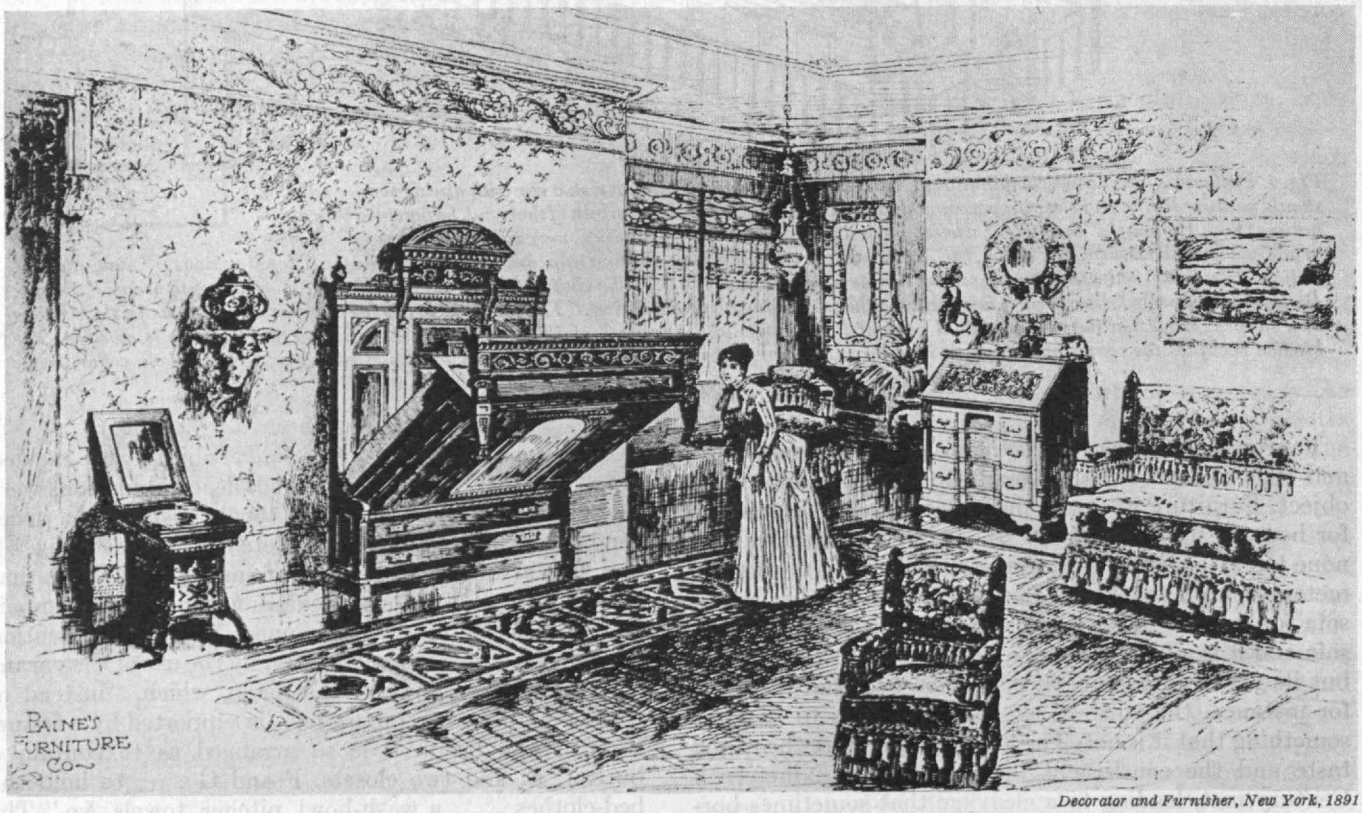
Fig. 5. The piano bed (1866), also containing a bureau and two closets to hold bedclothes, a washbasin, pitcher, towel, and so on. The economy of space that appears naïvely in the piano bed is part of a tradition that, although temporarily crushed by the ruling taste, has never been wholly forsaken in America — a tradition that reappears in the trailer and to an even greater degree in the Pullman roomette of 1937.

acquaintance is obvious. The inventor apparently sensed this as he commented on the limited usefulness of his piece: "The convertible piano has been designed principally for the benefit of hotels, boarding-schools, &c., containing apartments which are used for parlors, &c. in day-time and yet required for sleeping-rooms at night."

What interests us here is not the object — one of hundreds — but the method behind it. The economy of space that appeared naïvely in the piano bed forms part of a tradition that, although momentarily crushed by the ruling taste, has never been wholly forsaken in the United States. It reappeared in due time, in the equipment of the trailer or of the roomette.

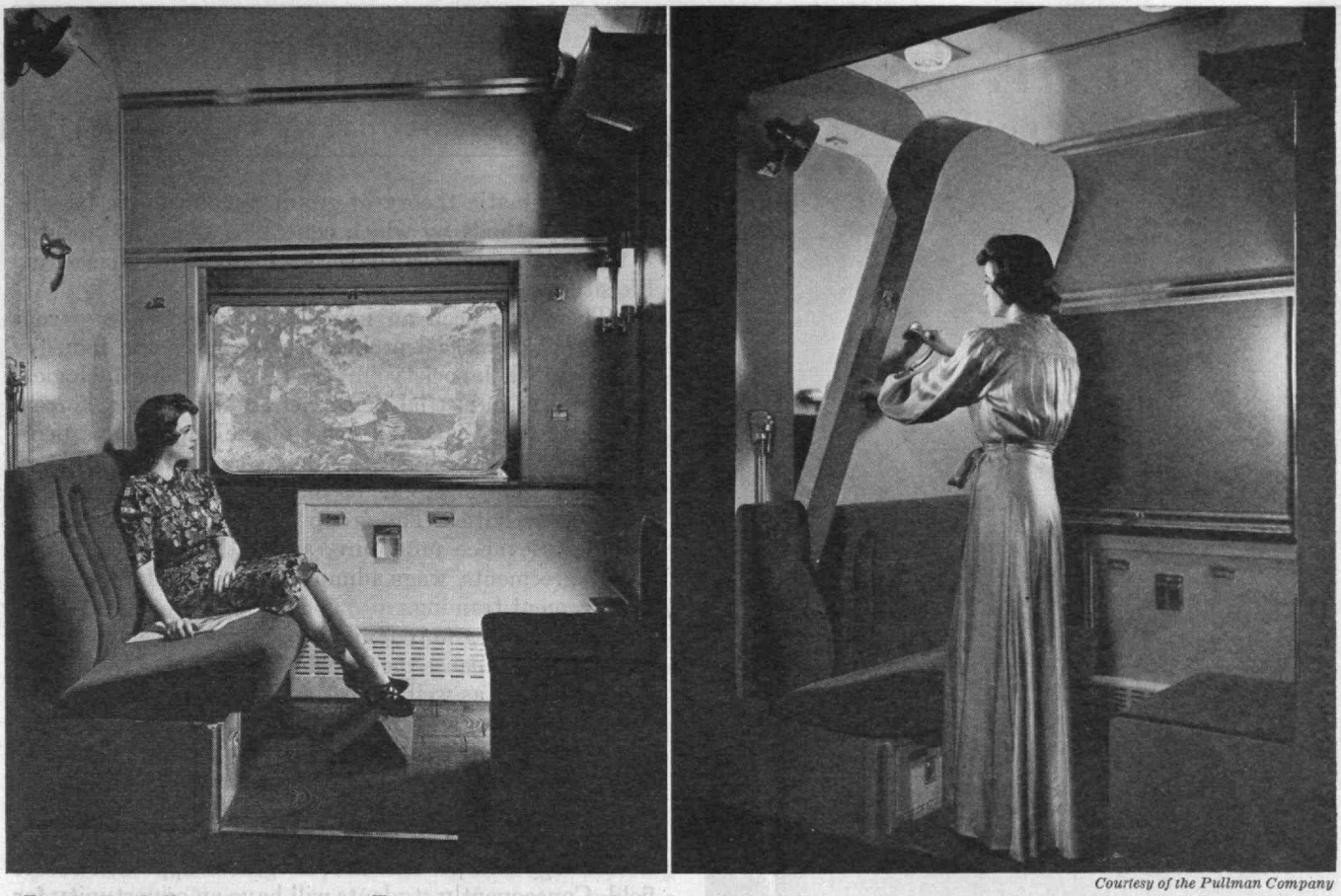
The roomette is an enclosed Pullman compartment with broad upholstered seats on either side. "To lower the bed you simply turn the handle located above the seatback, pulling it down, and holding it in that position. The bed will then lower on balanced springs, until it rests. . . ." [9] In the morning, when the traveler wishes to wash and dress, he releases a catch and the bed folds back. Now he has room enough to open the washstand, the clothes closet, and the toilet closet in the opposite wall. "By raising the cushion top of the seat, toilet facilities are afforded." The roomette

Still the inventor was not satisfied. He added thereto a revolving piano stool, "also reserved for a distinct patent." Its seat, when lifted, revealed a lady's workbox and a toilet mirror. Drawers and a hinged writing flap completed the roster of diverse equipment which it offered. The naïveté of combining objects that hardly gain by



Decorator and Furnisher, New York, 1891

Fig. 6. The parlor bed, 1891. An idea already used in the Seventeenth and Eighteenth centuries, "wardrobe beds" took the place of a separate bedroom in many American dwellings of the patent-furniture era. They eventually succumbed to the ruling taste, remaining almost extinct until revived in the roomette.



Courtesy of the Pullman Company

Fig. 7. The Pullman roomette, 1937. The roomette is not actually a room. It is combination furniture inside which the passenger can move. The bed, lowering on balanced springs, absorbs almost the entire floor space, whilst walls and upholstery will reveal closets, washbasin, and toilet facilities. It is one of the few convertible pieces in which the tradition of the Fifties has succeeded in living on.

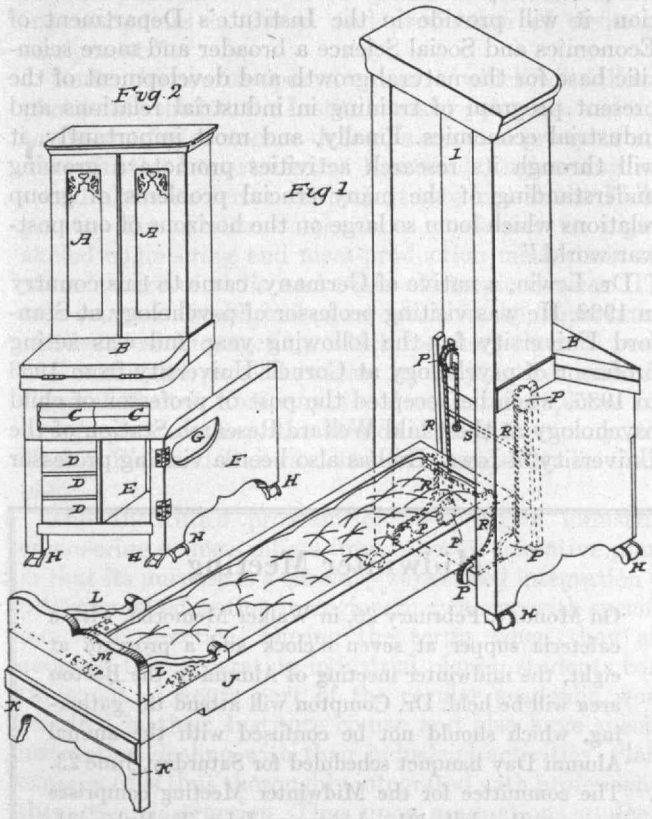


Fig. 8. The wardrobe bedstead (1859) is one example among many possessing "the combined advantage of a secretary, wardrobe, and toilet accommodations."

is not an actual room. It is combination furniture inside which a traveler can move. When unfolded, the bed absorbs the seat areas and the entire floor space.

This bed which, when folded away, becomes part wall and part upholstered back rest follows from the same principle as the wardrobe bedstead of 1859 (Fig. 8). Operating in both cases is the law of the transmutability of planes.

The roomette is one of the few convertible pieces in which the tradition of the Fifties has survived to the present day. The reason lies in its belonging to an institution that from its earliest phase has developed without break — the sleeping car.

The Sleeping Car in Europe

It is easy to understand that the democratic form of sleeping car had to be transplanted to Europe. The transplantation took place in England as well as on the Continent eight years after the *Pioneer* had first entered regular service. Pullman's shipment in 1873 of 18 sleeping cars to the mother country of railroads shows how relatively early American influence was felt in this branch.

The same year, another American entrepreneur ran the first sleeping cars over the Vienna-Munich route. The types used for this purpose are still current in the European service. Known as "boudoir-trains," they have their berths walled off into separate compartments. In contrast to the American berths, which run lengthwise, these are placed transversely. This arrangement comes from deeply rooted habits. In America, even in the Nineteenth Century, the rooms of a house flowed (*Continued on page 204*)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Kurt Lewin

Group Dynamics

ESTABLISHMENT at Technology of the Research Center for Group Dynamics, for study of the psychological forces that influence group behavior, has been announced by Robert G. Caldwell, Dean of Humanities. Kurt Lewin, formerly professor of psychology at the University of Iowa, who is distinguished for research in his field, has been appointed director of the new center, which becomes a division of the Department of Economics and Social Science.

The Research Center for Group Dynamics is expected to provide an integrated approach to a relatively new field within the social sciences and to supplement the activities of Technology's Industrial Relations Section. Initiated through a grant of the Marshall Field Foundation of New York and Chicago, Inc., the new research center has received additional grants from the Commission on Community Interrelations, New York, which is sponsored by the American Jewish Congress.

In announcing establishment of the Research Center for Group Dynamics, Dr. Caldwell outlined its significance and objectives. "The center," he said, "is the result of the development over the past several years of a new approach to the internal and external relations of human organizations. Research already carried out by Dr. Lewin and his students sheds new light on the causes of group behavior and the consequences of democratic as opposed to autocratic leadership in social groups. Dr. Lewin's researches have laid the foundation for a systematic theory of group dynamics. He has developed methods by which controlled scientific research in the social sciences can be successfully carried on in actual life situations.

"There has been an increasing realization in recent years that the social problems of business and industry and of our whole society are closely linked to technological progress. In industrial personnel administration, for example, the need is acute. Most of the important aspects of this profession involve either the administration of relations between groups or the leadership and guidance of group activities. The group aspects of such problems include grievance procedure, arbitration, negotiation of labor agreements, wage administration, and foreman and management training.

"Training in group dynamics has until recently lacked organization because the relevant research and theoretical developments, as well as the practical applications, have occurred more or less independently in a number of different fields, such as psychology, anthropology, sociology, and government. The common denominator is now emerging in the form of an integrated system of theory and practice. The Research Center for Group Dynamics at Technology will provide this integrated approach to the field. Consequently students will have an opportunity for the first time to obtain systematic graduate professional training of a type that will meet existing needs. As a complementary division to the Industrial Relations Section, it will provide in the Institute's Department of Economics and Social Science a broader and more scientific base for the natural growth and development of the present program of training in industrial relations and industrial economics. Finally, and most importantly, it will through its research activities promote a growing understanding of the many crucial problems of group relations which loom so large on the horizons of our postwar world."

Dr. Lewin, a native of Germany, came to this country in 1932. He was visiting professor of psychology at Stanford University for the following year and was acting professor of psychology at Cornell University from 1933 to 1935, when he accepted the post of professor of child psychology at the Child Welfare Research Station of the University of Iowa. He has also been a visiting professor

Midwinter Meeting

On Monday, February 26, in Walker Memorial, with a cafeteria supper at seven o'clock and a program at eight, the midwinter meeting of Alumni in the Boston area will be held. Dr. Compton will attend the gathering, which should not be confused with the annual Alumni Day banquet scheduled for Saturday, June 23. The committee for the Midwinter Meeting comprises Larcom Randall, '21, chairman, John T. Rule, '21, James Donovan, '28, and Robert C. Casselman, '39.

at Harvard University and the University of California, and has been a counselor to the United States Department of Agriculture since November, 1942. He is a member of the American Psychological Association, the Midwestern Psychological Association, the Society for Psychological Study of Social Issues, the Psychometric Society, and the American Association for Group Work. Dr. Lewin is also a member of the honorary professional society of Sigma Xi.

Dr. Lewin is the author of *A Dynamic Theory of Personality, Principles of Topological Psychology, The Conceptual Representation and Measurement of Psychological Forces, Studies in Topological and Vector Psychology,* and *Studies in Child Welfare.*

At present serving the government on a special war project, Dr. Lewin will start his work at the Institute at the beginning of the March term.

New Co-operative Course

PLANS for a professional course in electronics, in which the Philco Corporation will co-operate with the Institute's Department of Electrical Engineering, have been announced by President Compton. Highly developed production methods and the applications of electronics as in television will be emphasized in the course.

"Twenty years' progress has been made in the field of electronics during the war emergency," Dr. Compton declared in announcing the new course. "Tremendous opportunities will exist in all phases of electronics in applying wartime developments to the arts of peace, and the primary purpose of this new course of study will be to combine instruction in advanced theory at M.I.T. with regular planned work in the plants of one of the leading companies in design and production of electronic equipment."

Under the new co-operative course, which will follow a plan established at the Institute many years ago and lead to the master of science degree, a selected group of students in the Department of Electrical Engineering will spend alternate terms at the Institute and at the Philco plants. The Philco Corporation specializes in highly skilled engineering and mass-production methods in the manufacture of radio and other electronic devices. The new course is established as an option in the Department of Electrical Engineering, which for more than 25 years has conducted parallel courses in conjunction with the General Electric Company, the American Telephone and Telegraph Company, the Boston Edison Company, the Boston Elevated Railway, and the General Radio Company.

The Institute's program of co-operative industrial engineering courses differs from other co-operative plans in that its purpose is a carefully supervised integration of professional education in engineering theory with specific industrial practice. During the terms when they are assigned to co-operating industrial plants, students continue out of hours part of the regular academic work required in their Institute course and also have special instruction dealing with their industrial activities. Plant experience is thus thoroughly integrated with professional theoretical instruction. Thus upon graduation, students are already familiar with the fundamentals of industrial methods and policies, and well aware of what is expected of them as practicing engineers.

M. I. T. Photo

Horace S. Ford, Treasurer of the Institute, who has been elected a member of the board of directors of the Old Colony Trust Company, Boston. It was in this company that he began his financial career as an assistant bookkeeper in 1903. Eleven years later he left the post of assistant cashier of the Old Colony Trust Company to become bursar of the Institute, and in 1934 was appointed its treasurer. He is a member of the board of trustees of the Brimmer and May School of Boston, and after having served as a term member of the board of trustees of Middlebury College, was recently elected to life membership. Treasurer of the American Academy of Arts and Sciences of Boston, Mr. Ford is financial adviser to the National Academy of Arts and Sciences of Washington. He also has many corporate affiliations with business and industrial organizations.

Change and Development

WHAT the reasonably near future may be expected to bring to the Institute in physical changes and in intellectual developments was vividly portrayed at the 241st meeting of the Alumni Council, held on the last Monday of November in Pritchett Hall, Walker Memorial. James R. Killian, Jr., '26, Executive Vice-president of the Institute, outlining the Institute's program for reconversion to normal operations once the pressure of wartime research and training is relaxed, made it plain that though the details involved in the process are many and extremely varied, they can be reduced to order and handled in orderly fashion.

The new co-ordinated four-year program in the social sciences and the humanities which was brought into form during the past academic year by a Faculty committee after thoroughgoing study, was discussed by Robert G. Caldwell, Dean of Humanities. Sketching the aims and justification of education in different historical epochs, Dean Caldwell defined the purpose of education as the control of nature for the comfort of man and the development of individual character.

M. I. T. Photo

Bernard E. Proctor, '23

Raymond Stevens, '17, President of the Alumni Association, presided at the meeting, which was opened by an interesting interlude in which Lieutenant Colonel Jay Zeamer, Jr., '40, and Charles E Locke, '96, Secretary of the Alumni Association, appeared, Professor Locke as interlocutor and Colonel Zeamer as generous and friendly answerer of questions about his past experiences as an aviator in the Pacific and his present experiences as a graduate student at Technology.

At the opening of the evening, recordings of "Sons of M.I.T." were played, and O. B. Denison, '11, led the group in singing. Business included various reports, notable among them being that for Henry B. Kane, '24, director of the Alumni Fund, which showed totals as of November 27 of 8,726 contributors and $113,963.56 in gifts, both being well ahead of comparable figures for last year.

Josiah D. Crosby, '21, chairman of Alumni Day 1945, reported briefly on plans in process. Chairmen of subcommittees were elected as follows: *banquet*, C. Yardley Chittick, '22; *ways and means*, Horace S. Ford; *Class Day*, John D. Mitsch, '20; *publicity*, Ralph T. Jope, '28; *ladies*, Mrs. Leicester F. Hamilton.

Gastronomic Future

A FAR-REACHING program of research in food technology to study postwar problems of world food production, the improvement of products, and methods for retaining natural flavors and nutritive elements in processed foods will be undertaken in the Institute's new Division of Food Technology, the establishment of which was announced in November.

The extraordinary requirements of extended military and civilian needs have accelerated progress in food technology and the development of new food products in the past few years. Many of these developments, yet to be disclosed, have depended upon fundamental scientific investigations which promise important advances after the war. No less important than research on foods is study of methods of packaging food products to provide better protection against the ravages of temperature and time.

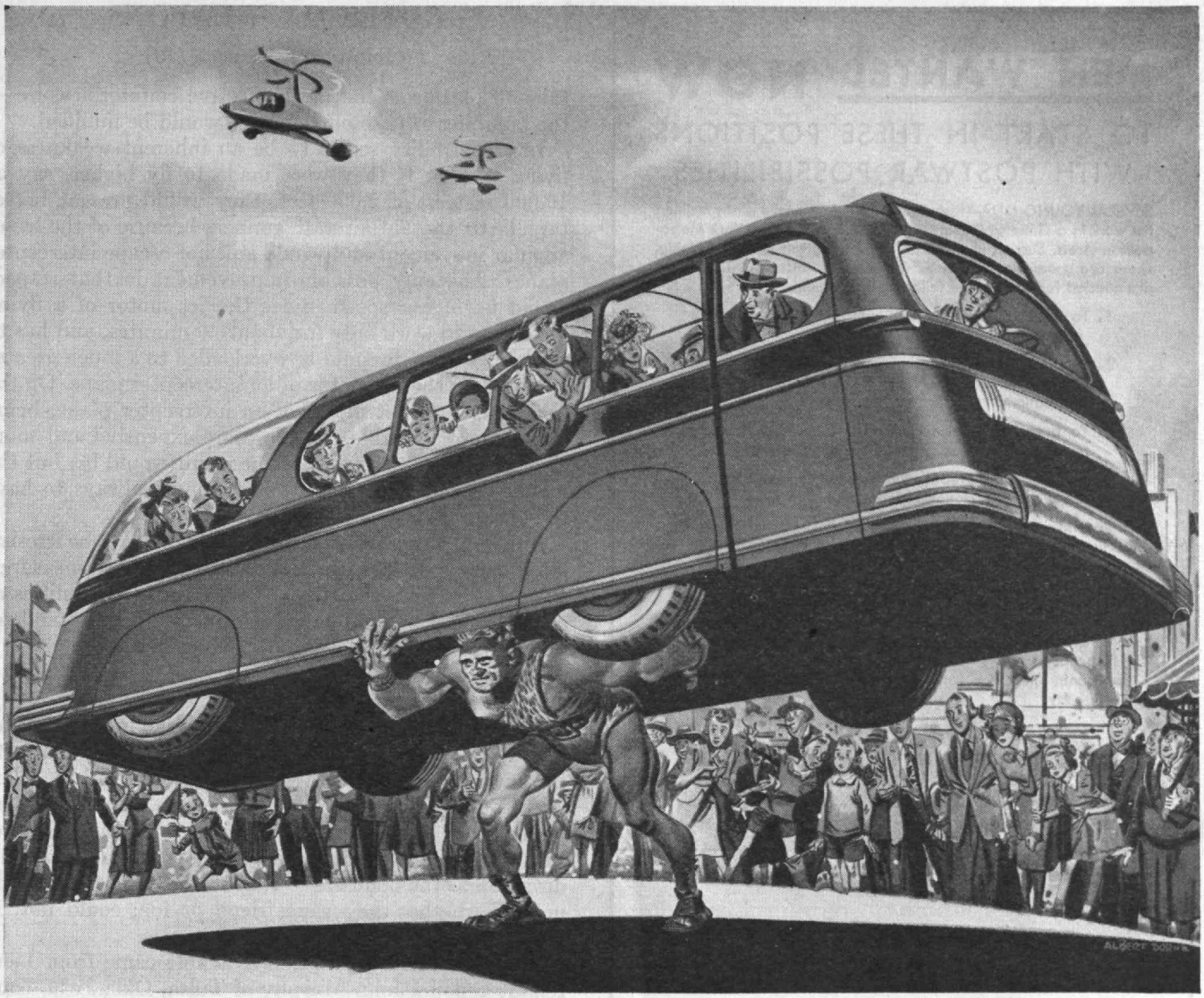
The director of the Division of Food Technology, which is part of the Department of Biology and Biological Engineering, is Professor Bernard E. Proctor, '23, for many years a member of the Institute's staff, who has just returned from leave of absence as director of subsistence and packaging research for the Quartermaster Corps of the United States Army.

In announcing plans for the new division, Professor Proctor said that the program will include a new five-year course offering special opportunities for returning servicemen. Each student in the course will spend at least six months in some of the country's great food manufacturing plants. Discussing the research program, Professor Proctor said that plans are being made for a fully equipped process equipment laboratory which would be devoted to food unit process studies. The new laboratory bears the name of Samuel Cate Prescott, '94, who, until his retirement in 1942, was for many years head of the Institute's Department of Biology and Public Health. He is one of the country's pioneers in food research, and his investigations during the years he was at Technology led to many important developments in techniques for the preservation of foods.

"The next decade," Dr. Proctor said, "will be the 'open season' for those huntsmen of food quality, the food technologists and research men who open the books of nature and science for translation by food manufacturers into new and better products. The research laboratory is now one of the most important parts of progressive food manufacturing plants, and the results of today's experiments will produce the outstanding surprises of tomorrow's dinner table. Plans are being made to extend the Institute's efforts in this direction, and our laboratories will utilize the experience gained in preparing special foods by various methods for millions of men in the armed services and the new knowledge of electronics for the improvement of food processes. In addition to electronic studies there will be a new microbiological unit for advances in analytical techniques for food components.

"One of our research groups will be assigned to the difficult and subtle problem of studying food flavors — what causes them, what impairs them, and how they can be better controlled and maintained. The travels of men in the armed forces to all parts of the globe and their pleasant experiences with strange but popular tropical fruits having unusual flavors may present additional flavor problems to the ultimate benefit of all Americans. In studies of packaging, investigations will be made of the new plastics and countless other packaging films, which will be subjected to new test methods to develop the ideal food package material and techniques of packing. The Institute's extensive research in high vacuum — that is, low-temperature methods of food dehydration from the frozen state — will be continued. In this research we have the unique opportunity of the co-operation with the laboratories and staffs of other Departments such as Physics, Chemistry, Chemical Engineering, and Mechanical Engineering."

(*Concluded on page 202*)



"Magnesium makes heavy work light"

Take such a commonplace thing as a bus! Suppose magnesium is used in its construction, what will that mean besides the fact that it is vastly lighter? (Magnesium's weight is only one-fifth that of iron.)

Well, to be brief, passengers will get a *more comfortable* ride, a *cheaper* ride, a *quicker* ride to their destinations. Operating Companies will make more profit.

Because, by eliminating useless weight it will be possible to add conveniences that were simply out of the question before—air conditioning for instance....Starting and stopping, which take up so much of the time spent on a bus will be much quicker—and smoother....The savings on gasoline, oil, tires, engine wear, will be very material indeed.

Not just in transportation, but in manufacturing, in business, in the home, similar elimination of useless weight through magnesium means priceless savings in time, in energy, in money. That is why Revere has added magnesium to the other metals it fabricates for American industry. With more than one hundred and forty years of accumulated experience in working with metals—we're the oldest in the country—we are particularly well fitted to help develop the many applications of magnesium for its wide range of uses.

At Baltimore, Md., we are already producing magnesium plate, sheet, rod, bar, tube, forgings and extruded shapes. And in connection with the war effort, we have acquired a vast amount of practical knowledge regarding the strength, safety and workability of this marvelous metal. This information is at your disposal for the asking. Just write to Revere Copper and Brass Incorporated, Executive Offices, 230 Park Avenue, New York 17, N. Y.

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NOTES ON WEAPONS

(*Continued from page 170*)

take-off platforms the most effective countermeasure — the bombing of take-off ramps — would be nullified.

Interceptibility seems to be an inherent weakness of flying bombs. If they were made to fly higher, say at 10,000 instead of 2,000 feet, they would present better targets to the antiaircraft gunners because of the lesser angular movement and would still not escape intercepter planes. The only possible improvement in that respect would be higher speed. Since the jet motor of a flying bomb has to work only for about 20 minutes, and has to work only once, it could be overloaded to a much greater extent than the jet motor of an intercepter plane. On the other hand the jet motor of an intercepter plane, being much more valuable, can be more expensive and more efficient. It is a tossup what the result would be, but the manned intercepter plane would appear always to have the better chances.

Analysis shows that flying bombs will never be irresistible weapons against which there are no countermeasures. But it also shows that flying bombs have possibilities as an additional weapon and will probably become and remain a piece of standard military ordnance.

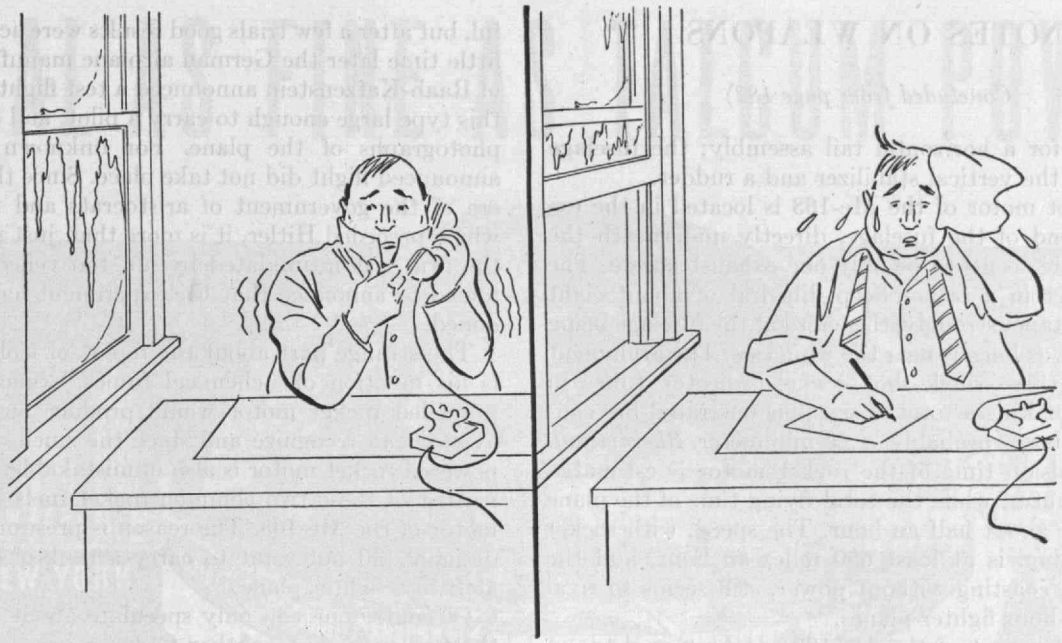
The Fighter Plane Me-163

Another weapon resulting from German military rocket research was the first rocket-propelled fighter plane to be sent into action, which was first encountered by Allied airmen on August 16, 1944, over Leipzig. Several of these planes were in the air, and bomber crews reported later that they were swishing by so fast — traveling in the same direction as the bombers — that the crew members could not tell whether they were friend or foe; could not, in fact, tell what these things were.

The best early description available came from Lieutenant Colonel John Murphy of Tulsa, Okla., who commanded an escorting Mustang squadron. He tried to catch one of the rocket planes which was driving for a Flying Fortress, but he failed because the German fighter "got there in one easy sweep, while I was grinding out all the speed I could." A little later, however, the same officer caught one of the strange fast foes at 23,000 feet. The German was much faster by far than the Mustang, but by the same token the Mustang was more maneuverable and forced the German into a dive for safety. Following it down to 10,000 feet, Colonel Murphy succeeded in getting in a prolonged burst of gunfire which caused the German plane to blow up. He related afterward that he was so close at this moment that he could smell the "chemical fumes" of the German's rocket exhaust.

The descriptions given by Murphy and other fighter pilots made it possible to form an accurate picture of this first rocket plane actually to take to the air for more than a short hop. (Fritz von Opel flew a rocket-propelled glider for about one minute near Frankfort on the Main in 1929.) The plane, identified as the Messerschmitt 163, has a very short and stubby fuselage, which does not project beyond the leading edge of the wing and extends only about three feet back of the trailing edge. In general construction it is, in brief, one of the prototypes envisaged by Hugo Junkers as leading to his conception of a *Nurflügel*, or all-wing aircraft. Since the fuselage is so short, there

(*Concluded on page 184*)



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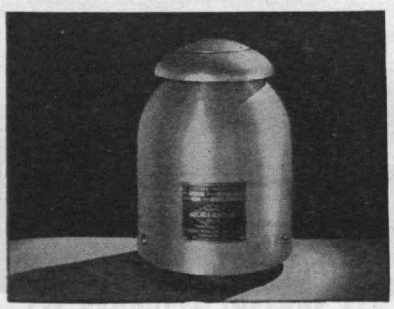

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AUTOMATIC Webster Steam Heating

NOTES ON WEAPONS

(*Concluded from page 182*)

is no room for a horizontal tail assembly; the fuselage carries only the vertical stabilizer and a rudder.

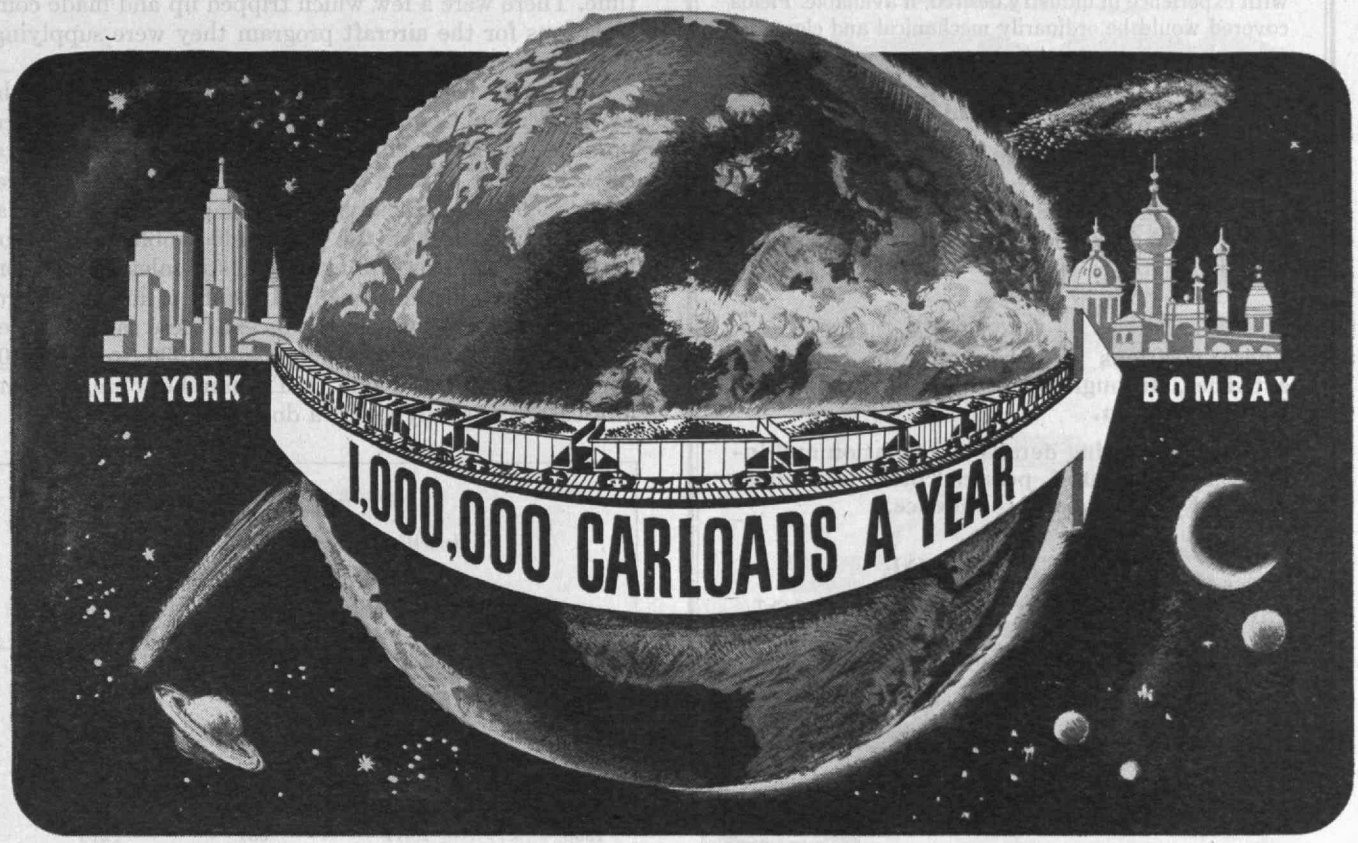
The rocket motor of the Me-163 is located in the extreme tail end of the fuselage, directly underneath the rudder. There seems to be only one exhaust nozzle. The wings are set in a rather deep dihedral of about eight degrees and taper strongly, the chord at the fuselage being almost twice as long as near the wing tips. The armament consists of three single-shot rocket-projector tubes in each wing, making a total of six, plus one rapid-fire cannon in the nose, probably a 20-millimeter *Rheinmetall*. Total propulsion time of the rocket motor is estimated at eight minutes, while the total flying time of the plane is said to be about half an hour. The speed, with rocket motor working, is at least 650 miles an hour, and the plane, when coasting without power, still seems to rival 350-mile-an-hour fighter planes.

The development of the Me-163 can be traced to experiments made in 1928 by the German *Rhön-Rossitten Gesellschaft*, a glider society which received its name from the geographical locations of its two most important camps. In that year the RRG made experiments with small airplane models about six or eight feet in wingspread, of the then new type *Storch* (stork), created by the designer Lippisch. The rockets used were high-compression black-powder rockets manufactured by Friedrich Wilhelm Sander in Wesermünde. The experiments miscarried at first because the rockets proved to be too powerful, but after a few trials good results were achieved. Some little time later the German airplane manufacturing firm of Raab-Katzenstein announced a test flight of a plane of this type large enough to carry a pilot, and even released photographs of the plane. For unknown reasons the announced flight did not take place. Since this was in the era of the government of aristocrats and military men which preceded Hitler, it is more than just probable that the firm was intimidated by not too veiled threats and forced to announce that the experiment had been abandoned.

The strange part about the report of Colonel Murphy is his mention of "chemical fumes." Since a gasoline-propelled rocket motor would produce an exhaust any aviator can recognize and since the smell of an alcohol-powered rocket motor is also unmistakable, it seems that neither of these two common rocket fuels is used in the motor of the Me-163. The reason is presumably that the designer did not want to carry a tank of liquid oxygen aloft in a fighter plane.

Of course one can only speculate about the nature of the fuel used, but another German news story, quickly suppressed by the *Reichswehr*, seems to furnish a valuable clue. In 1930, the engineer Sander, already mentioned as manufacturer of the powder rockets for the experiments of the *Rhön-Rossitten Gesellschaft*, demonstrated a medium-sized flare-carrying rocket of all-metal construction which was propelled by a "liquid powder," a black and viscous liquid looking like heavy oil. It functioned well, but no further information on this liquid powder was ever printed. It is possible that it was later developed into the fuel now propelling the Me-163.

COAL AS FINE AS TALCUM POWDER



To reduce the solid and hard substance of coal to the fineness of talcum powder so it will burn more efficiently and completely is the function of the C-E Raymond pulverizing mills built for power plants by Combustion Engineering.

The C-E Raymond Mills installed for this purpose up to the present time are capable of grinding about 50,000,000 tons of coal annually — the capacity of a million standard coal cars. Were a train to be formed of these cars, it would stretch around one-third of the earth's circumference—from New York to Bombay.

The development of pulverized coal firing and its application in the field of steam generation are largely responsible for the unprecedented progress made in that field during the past 25 years. The large high-pressure, high-temperature steam generating units of today — some capable of producing sufficient steam to generate all the electricity for the domestic requirements of a city of over 1,000,000 population — owe their very existence to the successful development of pulverized fuel firing.

These 1,000,000 coal cars with their 50,000,000 tons of coal are evidence of the major role taken by Combustion Engineering in pioneering and perfecting this modern method of coal firing. The successful commercial application of this development initiated a chain of improvements in the whole steam generation field that have helped the utilities to meet the nation's vast electrical demand, and with two-thirds less coal.

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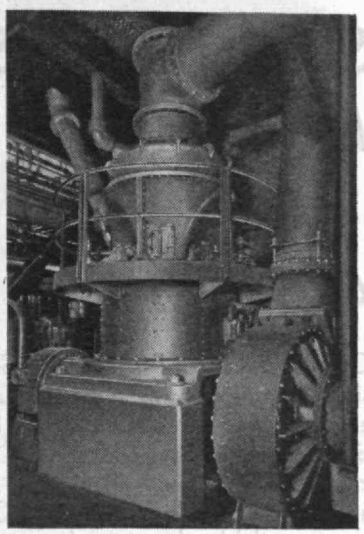

This C-E Raymond Mill, one of several in a large utility plant, pulverizes more than 20,000 lbs. of coal per hour.

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THE MAGNESIUM PROSPECT

(*Continued from page 168*)

magnesium products faced also the uncertainties resulting from the fact that most of the magnesium fabricators were newcomers, trying to learn and produce at the same time. There were a few which tripped up and made complications for the aircraft program they were supplying, but in general the new operators performed nobly.

During the last pre-war year for magnesium, 1939, the Dow Chemical Company, then the sole American source, produced some 6,600,000 pounds. Its domestic metal sales, however, totaled only 1,800,000, with foreign sales at 3,800,000, practically all of which went to Great Britain. Indicative of the peacetime problems faced by magnesium are Dow's annual domestic sales figures from 1936 through 1939 especially. In spite of increased promotional activity by the producers, these sales dropped slightly, from 2,000,000 pounds in 1936 to 1,800,000 pounds in 1939 (see Table 1). The number of magnesium fabricators was only about a dozen.

TABLE 1

Domestic Sales of Magnesium Ingot
(The Dow Chemical Company)

Fiscal Year	*Amount of Metal (thousand pounds)*	*Dollar Value (thousand dollars)*	*Average Sales Price (per pound)*
1920	20*	$ —	$1.60†
1925	70*	—	.86†
1930	526	292	.555
1935	697	155	.222
1936	2,035	443	.218
1937	2,104	450	.214
1938	1,611	351	.218
1939	1,848	378	.204
1940	4,294	823	.192
1941	4,572	832	.182
1942	13,149	2,742	.209

* Production, not sales, for these years. The American Magnesium Corporation also produced small amounts in these years.

† Stated market price.

Source: Data submitted by the Dow Chemical Company to the Truman Committee last March.

A substantial share of the pre-war magnesium ingot was used as an alloying ingredient for high-strength aluminum alloys. Castings composed almost 80 per cent of the fabricated products, most of which went to the aircraft industry. Other uses included portable tools, electric motors, foundry equipment, business machines, roller conveyers, and miscellaneous other applications. Pure metal in various forms was used for a variety of chemical purposes, such as deoxidizing in metallurgical operations, debismuthizing lead, Grignard reactions, and degasifying a number of metals.

In 1940 the Dow Chemical Company expanded its original plant at Midland, Mich., and built the first of its now famous sea-water magnesium plants at Freeport, Texas. This Freeport plant, initiated by Dow, was soon enlarged with financial help from the British and later was further expanded with United States Government funds. Plants in various parts of the world previously had used sea water to produce magnesium compounds, some of

(*Continued on page 188*)

THE MAGNESIUM PROSPECT

(*Continued from page 186*)

which were later converted to $MgCl_2$ and then electrolyzed to give metallic magnesium. The plant at Freeport, however, was the first to combine in one location the whole process from sea water to metallic magnesium. It has played a great part in the supply of war magnesium, having operated much of the time at more than 10 per cent above its rated capacity. In 1941 the Permanente Metals Corporation in California began operations in a plant to produce magnesium by reducing MgO with carbon in an electric furnace. Previous plants using this process had been operated in Austria, in England, and in Manchukuo, all with questionable success. Dark predictions were made for the Permanente operation, but they largely have been disproved by the plant's subsequent performance.

The Dow plants at Midland and Freeport and the Permanente plant are the extent of the privately financed plants. The government initiated a 400,000,000-pounds-a-year program in 1941 and increased it in early 1942 to a total, including both public and private plants, of 600,000,000 pounds a year. The government owns more than 500,000,000 pounds of annual rated capacity, or over 40,000,000 pounds a month, for which it has invested about $400,000,000. These plants, distributed over all parts of the United States, use a variety of processes and raw materials. They were chosen for a number of reasons, including speed and dependability of getting into production; most efficient use of scarce materials and electric power; security against enemy action, either bombing or sabotage; best use of available engineering talent; adoption of a promising variety of processes so that this country would not overlook possible new developments in magnesium technology.

The capacity for semifabricated magnesium products such as castings, forgings, extrusions, and sheet is about 15,000,000 pounds a month, a large part of which will be available after the war for useful commercial products. This does not include 12,000,000 to 15,000,000 pounds a month of fabricating capacity which is devoted to incendiary bomb castings and powder for tracer ammunition and other ordnance, and is not adaptable to peacetime production. Of the commercially useful capacity, some 11,000,000 pounds are in sand castings, around 2,000,000 in permanent-mold and die castings, and about 2,000,000 in the wrought products, including sheet, forgings, and extrusions. This last is an arbitrary figure, as magnesium wrought products can be produced on aluminum facilities also. Most of the structural-type fabricated magnesium has been used in aircraft, with small amounts going to other military applications, to export, and to civilian or experimental work.

The wartime need for magnesium arises largely from the metal's two publicized properties of incendiary excellence and lightness in weight. Other properties, less famous but necessary to any reasonable thinking on the subject, include corrosion resistance, strength, stiffness, machinability, and behavior under high temperature. About half of our wartime magnesium has been destined to set fire to enemy property. Magnesium powder goes into incendiary bullets, tracer ammunition, and signal

(*Continued on page 190*)

THE MAGNESIUM PROSPECT

(*Continued from page 188*)

ammunition, while the body of the standard incendiary bomb is a magnesium casting. Obviously there is no corresponding peacetime use. The success of magnesium in wartime fire making leads to sales problems in peace.

The story of how magnesium burns is well known — too well known, and too often exaggerated. Magnesium and its alloys do burn persistently when ignited, but, more important in postwar thinking, they ignite only with great difficulty when in the common structural forms. Thousands of military contractors and subcontractors throughout the country have become accustomed to working magnesium during the war; many of them intend to continue with it in their peace products and no longer have a false fear of its danger.

The use of millions of pounds of magnesium in today's military and commercial airplanes attests its structural safety. Magnesium is welded by both torch and electric arc in common shop practice today. Even more striking is the use of other millions of pounds of it for tubes for launching rockets. These tubes are about 10 feet in length and 4.5 inches in diameter, with a 3/16-inch wall. Dozens of rounds of rockets have been fired from them, with no appreciable damage to the tubes. Not so striking, but closer home, is the successful use of magnesium pancake griddles for over 10 years. Magnesium producers, fabricators, and users, together with fire insurance companies, are working in the development of information and procedures which rapidly are removing suspicion of magnesium as a common industrial material.

Light weight is magnesium's greatest claim to use in construction. Approximate weights, per cubic foot, of several common materials are as follows:

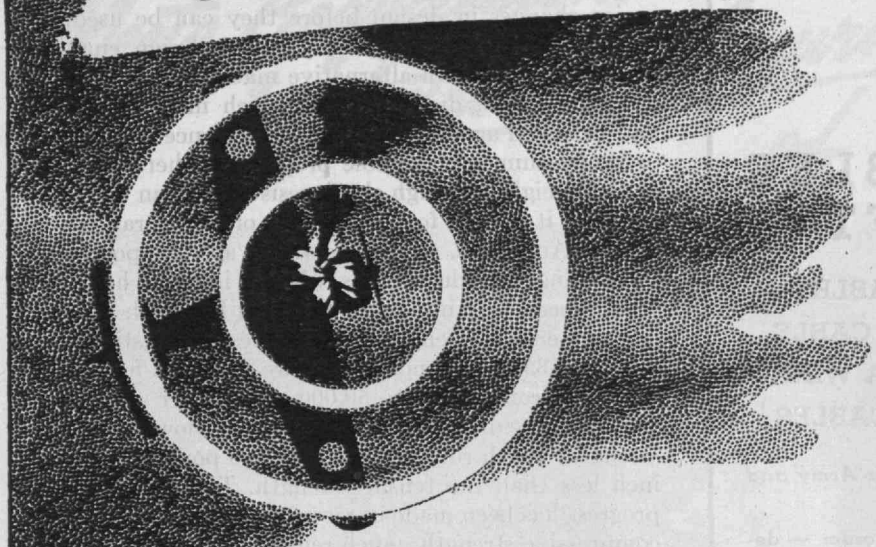
Cork	13 pounds
Birch lumber	44 pounds
Maple lumber	49 pounds
Water	63 pounds
Magnesium	112 pounds
Aluminum	175 pounds
Steel	493 pounds
Brass	531 pounds
Lead	706 pounds

Aircraft are the most obvious field for saving weight in either war or peace. Mortar bases, gun carriages, artillery wheels, and rocket launchers are a few of the nonflying applications already made known; others must remain unannounced for military reasons.

Overenthusiastic exponents have publicized the statement that every pound of magnesium which can be used as a substitute for aluminum will add one-half pound to the cargo-carrying capacity of the airplane, or permit it to carry one-half pound of additional gasoline. This statement often is not true. It is the case only when the volume of the magnesium part is as small as the volume of the aluminum part it replaces. Cork is less than 1/10 the weight of aluminum, but no one commonly proposes making major engine parts out of cork; because its disadvantages for that use are obvious. Magnesium, too, offers complications. Often a larger section must be used in magnesium to equal the strength of a given aluminum section, which makes the net weightsaving less than the

(*Continued on page 192*)

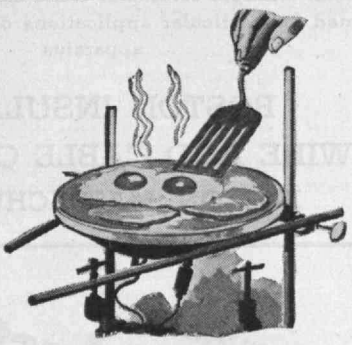
CURIOUS FACTS ABOUT LIGHTING



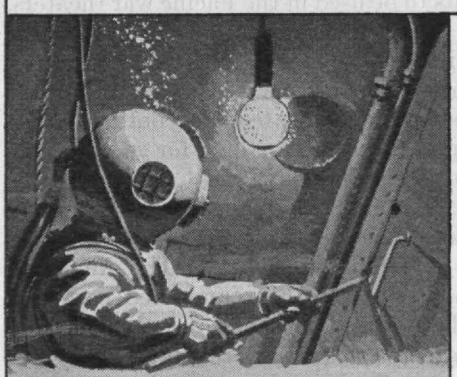
LIKE SHOOTING FISH IN A BARREL . . . There was a time when Jap Zeros could "sit in the sun" and come in with guns blazing — protected from our gunners by blinding sunlight. Not long ago, they had an unpleasant surprise. U. S. Army and Navy gunners now have a *new Westinghouse gunsight lamp* that lets them fire with deadly accuracy — directly into the sun. Formerly, our gunners could aim within only 15 degrees of the sun, leaving a dreaded "blind spot". This has now been removed — and, with it, a lot of Japs.

Lamps of 10,000 different types, using from 1/10th to 10,000 watts — incandescent, fluorescent, infrared, ultraviolet lamps, produced at the rate of about 1,000,000 units daily — lamps for seeing, for heating, for fighting disease — *wherever you see the Westinghouse Mazda Trade Mark, you'll find top quality!*

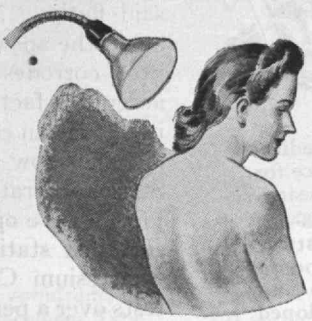
CEILING, 2000 . . . Vital "ceiling" information is provided for American fliers by *alidade* sighting device, which "draws a bead" on a cloud — illuminated by giant Westinghouse searchlight. Height is read directly in hundreds of feet.



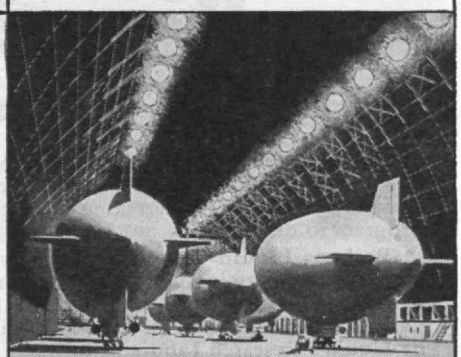
HAM AN' . . . New sealed-beam landing lights for army bombers are so powerful that a Westinghouse engineer actually cooked a meal on the surface of an upturned lens. Infrared rays did the trick.



DAVY JONES could find good use for this 1000-watt sea salvage lamp. Inside are loose grains of tungsten which the diver can whirl against the glass — to scour off clouding particles emitted by the filament.



SELF-CONTAINED SUN LAMP, developed by Westinghouse, produces comfortable warmth with infrared, as well as beneficial ultraviolet rays. Mercury vapor, electrodes, reflector, and incandescent filament are sealed in a reflector bulb of special glass, which screws into any lamp socket.



MAXIMUM "SEE-ABILITY" is provided by Westinghouse 3-kilowatt mercury lamps — in blimp hangars, airplane factories, steel mills, etc. These lamps produce 120,000 lumens of light.

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Blue Network

THE MAGNESIUM PROSPECT

(*Continued from page 190*)

suggested one-third. Other characteristics of magnesium alloys often entirely preclude use of them or require major changes in design before they can be used. The designer of aircraft, as well as most design engineers, is usually faced with alternative materials, each with its advantages and disadvantages which must be weighed and balanced against the final performance required.

Magnesium has valuable properties other than lightness in weight. Its high shock resistance is an added reason why it is used for 75 per cent of all aircraft landing wheels. Auto, bus, and truck wheels also are possibilities now being considered; bus wheels, in fact, have been tried successfully in Germany and in England.

The tensile strength for magnesium castings runs 20,000 to 35,000 pounds per square inch, and for wrought products from 30,000 to 50,000 pounds per square inch. A peculiarity of its wrought forms is the low compressive strength, which runs 10,000 to 20,000 pounds per square inch less than the tensile strength. Though substantial progress has been made in recent years toward increasing compressive strength, much remains to be done.

Designers must bear in mind also the directional properties of wrought products. Forgings and extrusions are stronger in the direction of working than across, whereas sheet is stronger in the transverse direction. Considerable advance has been made in recent years toward minimizing these directional differences. Usually they are undesirable, yet in some specific applications the designer can use them advantageously.

When equal weights are considered, magnesium alloys are stronger in bending than most aluminum alloys and considerably stronger than mild steel. Where stiffness with light weight is important, magnesium stands out even more. Stiffness increases with the cube of the depth of the section, and magnesium allows for increased depth of section with little increase in weight.

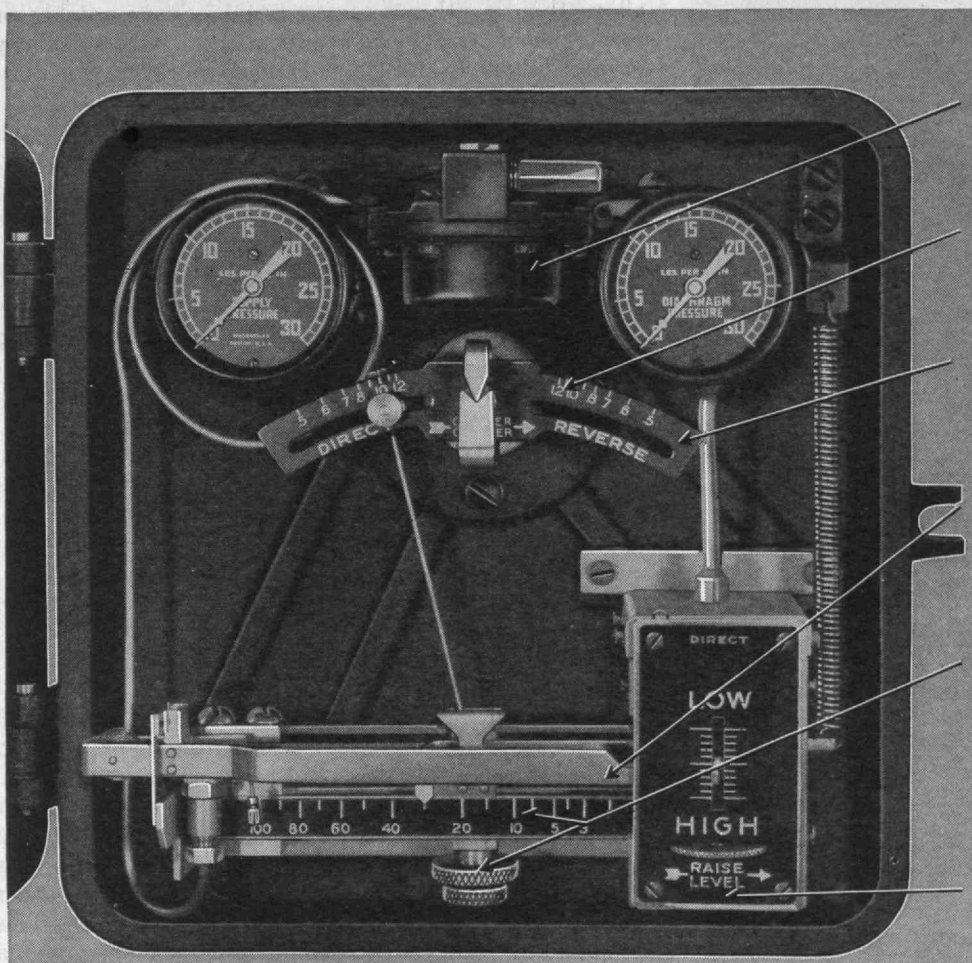
Corrosion long has been considered a plague on magnesium. One engineer, when asked about magnesium for any components to be used in the Pacific war theaters, said flatly, "No — and the reason is corrosion." Here again the answer is not that simple, nor that pessimistic. Steel corrodes — rusts — worse than magnesium, but we accept the fact, keep the steel painted, and continue to use it. To obtain comparative corrosion data for various metals, the Dow Chemical Company, the Carnegie-Illinois Steel Corporation, and the International Nickel Company jointly have operated for over two years a salt-air corrosion test station at Wilmington, N. C. The American Magnesium Corporation, too, has conducted corrosion tests over a period of years. Thousands of specimens have been exposed to a great variety of severe salt-air and water conditions. Unprotected magnesium samples stand up equally well with unprotected aluminum samples, better than galvanized iron, and much better than unprotected steel. Under these salt- and moist-air conditions magnesium alloys with recommended paint protection have stood up for two years with negligible deterioration.

Metal with flux inclusions deteriorates much more rapidly than metal without them. War experience has shown that competent manufacturers can eliminate flux inclusions, so that their products in the future should not

(*Continued on page 194*)

New Masoneilan Series 12,000 Displacement Type Controllers

Meets Requirements for Extremely Accurate Control of Liquid Level



Pilot. Large area metal bellows and great air capacity. Unit mounting, eliminating any major air tubing connections.

Calibrated Specific Gravity Scale. Adjustable from .5 to 1.2 sp. gr. or from .8 to 2.0 sp. gr.

Control Action. The control action is always clearly indicated and the procedure to reverse the action is simple.

Control Mechanism. New principle. Sensitive to .001" change in level. Complete elimination of pivot bearings. Proportional band adjustment without high multiplication.

Proportional Band. Calibrated 1 to 100%. Over 4" scale. Linear proportional characteristics to close limits in all settings. Adjustment with minimum upset of control point setting.

Convenient Setting Index Scale. Wide scale provides control point setting through full level range. Vernier knob for smooth and positive adjustment.

No matter what your liquid level control requirements ... the new Masoneilan 12,000 Series Displacement Type Level Control will provide positive, accurate liquid level control.

This new series introduces a number of unusual features not found in any other type of controller. The new type of control mechanism eliminates pivot bearings ... provides extreme sensitivity. Proportional band adjustment is obtained with minimum upset of control point setting. Calibrated specific gravity scale is adjustable from .5 to 1.2 sp. gr. or from .8 to 2.0 sp. gr. Proportional band scale is calibrated 1 to 100% ... scale over 4" long for easy adjustment.

The 12,000 series controllers are available in a wide choice of standard ranges from 14 inches to 15 feet. They meet practically all requirements for level control including interface service, specific gravity control and remote level indication. Write specifying your problems and Masoneilan Engineers will make their recommendations.

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THE MAGNESIUM PROSPECT

(*Continued from page 192*)

suffer corrosion from this source. Small amounts of iron and nickel have been found harmful. Most of the alloys now used in the United States for wrought products are held to a maximum of .005 per cent iron and .005 per cent nickel, and as a result they show marked improvement in corrosion stability. Much progress in corrosion-resistant magnesium alloys and finishes has been made in the past five or six years; further improvements are on the way.

Notch sensitivity is somewhat higher in magnesium alloys than in other common metals. Sharp notches or corners should be avoided in any material, but particularly in magnesium. In most applications, however, this difficulty may be overcome by proper design.

Maintenance of mechanical properties at elevated temperatures is a characteristic needing improvement. Magnesium is not generally recommended for stressed parts at temperatures over 400 degrees F. Research is going ahead on alloys to raise this limit. Present magnesium alloys used for forgings show more creep at increased temperature than do casting alloys; hence most magnesium engine parts today are made of castings. If forging alloys can be developed with less creep at high temperatures, greater use of magnesium can be made in engines, superchargers, and other new equipment.

Machinability is one of magnesium's strong points. The following are given as the relative power requirements to machine various metals:

Magnesium alloy (cast or wrought)	1.0
Aluminum alloy (cast or wrought)	1.8
Yellow brass (cast or wrought)	2.3
Cast iron	3.5
Mild steel	6.3
Nickel alloys	10.0

Magnesium sheet usually must be worked warm (200 to 650 degrees F.), and, after severe forming or welding, some of the sheet alloys should be stress-relief annealed. If not properly relieved, they tend to crack open under the internal locked-up stresses which occur in the forming or welding operation. Magnesium is not alone in this stress-cracking sensitivity, but it suffers more than other common metals. The difference is one of degree. This trouble was widely discussed in aircraft circles over a year ago, and the resultant uncertainty over the behavior of magnesium sheet assemblies doubtless prevented some firms from going ahead with new magnesium sheet applications. It is now known that holding such an assembly at 265 to 500 degrees F. for an hour will relieve the welding stresses so that stress cracking should not be a serious problem.

Hot-forming is considered an objectionable requirement by some engineers, especially the ones who haven't tried it. By contrast, many firms, including for example one which manufactures seats for combat and transport aircraft, say they prefer to work magnesium, now that they have mastered a few tricks of the trade. Magnesium saves up to six pounds in some of the seats.

The foregoing discussion is not intended as a complete listing of the design features of magnesium. It merely suggests a few characteristics as illustrative of the points which must be considered in making any analysis of the present or the future for magnesium.

(*To be concluded*)

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Don't feel that your job is too small, too large, or too "far afield." You can engage any part or parts of Taft-Peirce Contract Service. Or you can engage the complete facilities *and give yourself another plant overnight*. Let us know what arrangement would most benefit *you*. Write to The Taft-Peirce Manufacturing Company, Woonsocket, Rhode Island, U. S. A.

FOR DESIGN, TOOLING, CONTRACT MANUFACTURING

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MICROBES THAT WORK FOR MAN

(*Continued from page 172*)

Aspergillus niger growing on a sugar substrate to produce citric acid demonstrates a fundamental characteristic of the mold fermentations. This characteristic serves to explain in part the necessary limitations in certain of the processes currently used for the production of penicillin, which is made by another mold fermentation. Molds are strongly aerobic; when grown on unagitated liquid mediums, they form a mycelium or surface mat. Production of citric acid by Aspergillus is strictly intracellular, with the consequence that output is limited by the extent of such surface growth. The classic method for circumventing this limitation utilizes shallow pans having extensive surface area; a typical citric acid manufactory may, in fact, have literally acres of such pans. Requirements for rigidly controlled sterility in penicillin production rule out the use of such apparatus, so that the surface growth of *Penicillium notatum* is carried out in large bottles, which are only partially filled and are tilted sidewise in order to attain maximum surface area of the liquid medium.

This problem of obligate aerobiosis is not unique to the mold fermentation industries. It is also inherent in the bacterial process used to make vinegar, where the difficulty is solved through percolation of the substrate downward through a tall, well-ventilated column containing wood shavings. A comparable procedure, the "trickle" process, has been developed for penicillin manufacture. The greatest promise for augmenting penicillin output, however, appears to lie in the "deep" or "submerged" process, which depends upon forced aeration of a fluid substrate in large tanks by the introduction of sterile air. This parallels a similar practice in yeast manufacture, where the alcoholic fermentation is carried to the point of maximum yeast yield by forced aeration of the mash. A submerged method for citric acid production has recently been patented and now awaits plant-scale trial.

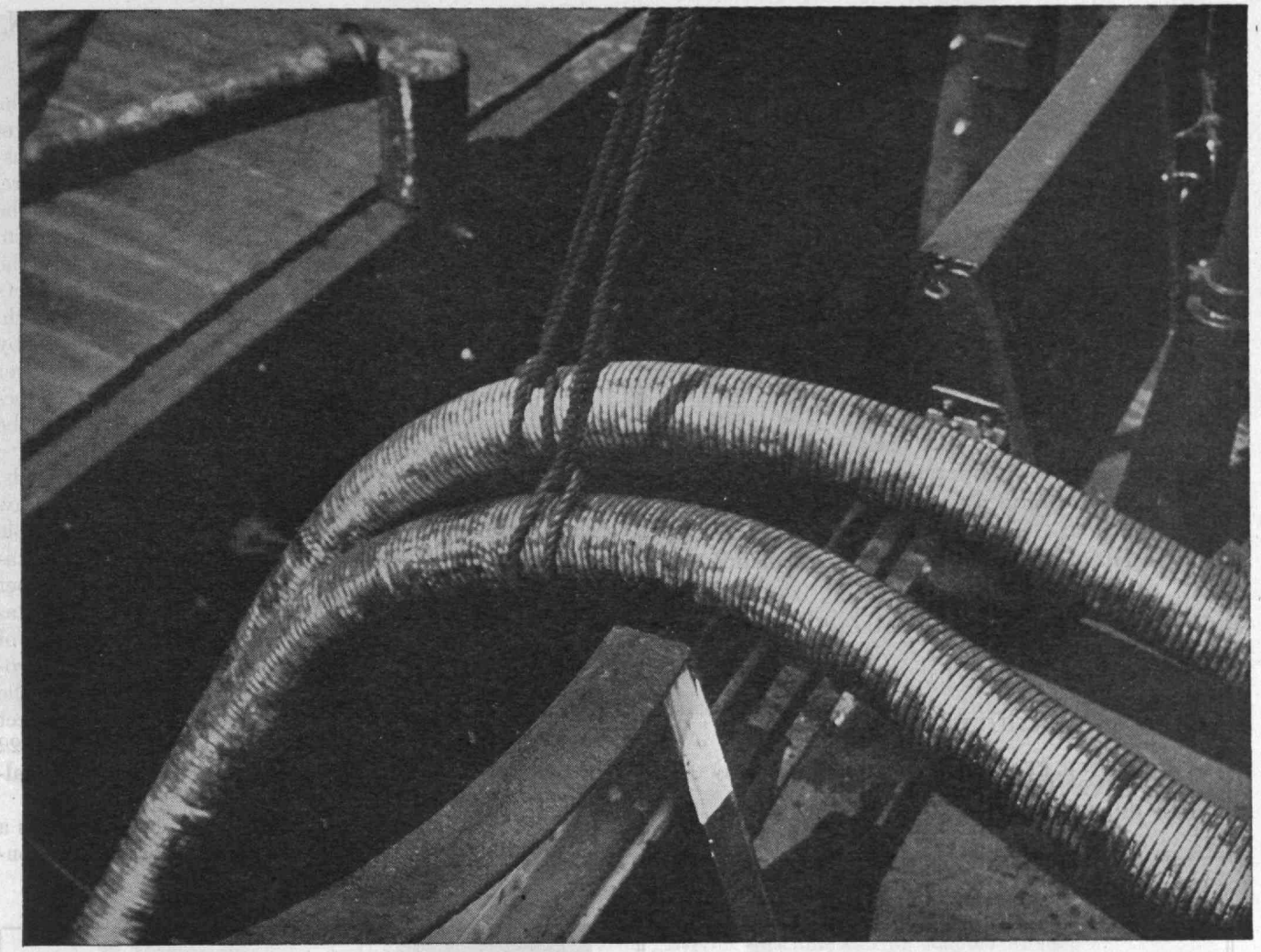
The citric acid process, a relatively new member of the fermentation industry, furnishes support of our contention that useful micro-organisms are increasing in importance. Twenty years ago this country, in common with the rest of the world, depended for its citric acid supplies upon Italy, Hawaii, and the West Indies, then the sole sources of fruits of high citric acid content, the culls of which were processed to extract the acid. Today, however, the United States is self-sufficient in citric acid supplies, thanks largely to development in this country of the fermentation method for the manufacture of this essential chemical.

The remaining mold fermentations of importance are those productive of gluconic acid, lactic acid, gallic acid, kojic acid, fumaric acid, and mannitol.

In sum, the major products of yeast fermentations are alcohols; of bacterial fermentations, alcohols and organic acids; and of mold fermentations, organic acids. Note that ethanol is produced by yeasts and by bacteria, and that lactic acid results both from bacterial and from mold fermentations.

This brings us to consideration of two topics germane to all of the industrial fermentations — the first of these, the question of yield; the second, that of diseases affecting useful microbes.

(*Continued on page 198*)



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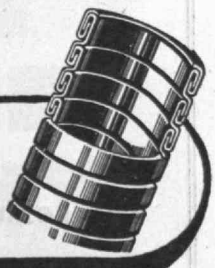

MICROBES THAT WORK FOR MAN

(*Continued from page 196*)

When regular chemical reactions are utilized for the industrial production of chemicals, speed and completeness of reaction can be governed by the chemist's customary methods of regulating temperature and pressure, using catalysts, and removing end products. Beyond the maintaining of a temperature optimal to the organism involved, such procedures are not applicable to the biological fermentations. The proportion of end products may in one process be governed by aeration of the mash, but a definite limit on total yield is always imposed by the particular fermentation used. Because of the ever present threat of competitive chemical synthetic processes, successful commercial fermentations had to be developed to produce high yields.

Of the several bases for evaluating fermentation yields, one is quantity of end product produced per ton of raw material. An extension of this measure, widely applicable because most of the raw materials of industrial fermentations are agricultural in origin, is quantity of product per acre devoted to growing the raw material. The fermentation production of ethyl alcohol is strikingly illustrative of these two criteria, because the raw material which produces one of the highest yields per ton gives one of the lowest yields per acre, and vice versa. The sugar beet yields over 285 gallons of alcohol per acre but only 22 gallons per ton, whereas wheat, which yields but 33 gallons per acre, produces 85 gallons per ton.

A third measure of fermentation efficiency, which is a closer criterion of actual productivity, is percentage con-

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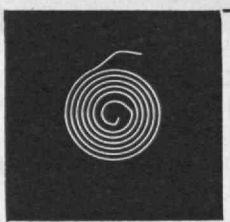

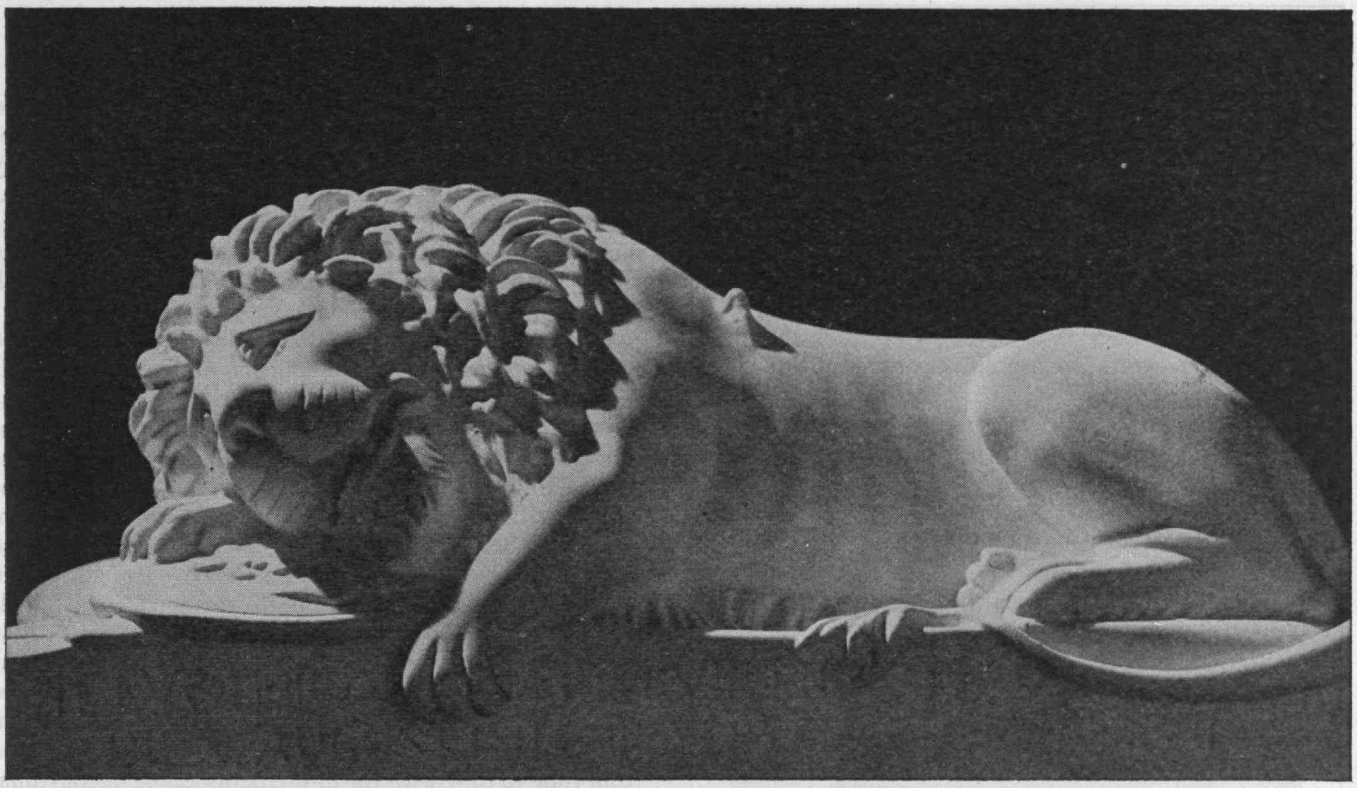

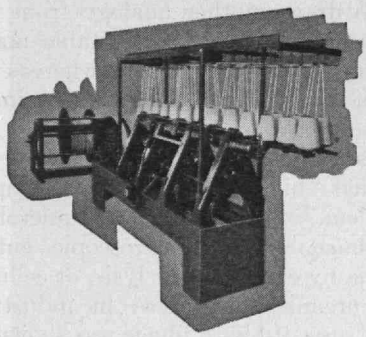

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MICROBES THAT WORK FOR MAN

(*Continued from page 198*)

version of carbohydrate in the substrate to the desired end product. A fermentation process must usually effect at least a 20 per cent conversion to be economically practical; in actual practice such conversions range as high as 97 per cent. High-yield industrial fermentations include those used to produce ethyl alcohol, acetone, acetic acid, butanol, butyric acid, citric acid, glycerol, gluconic acid, kojic acid, lactic acid, and *l*-sorbose.

Is it, then, conceivable that today over $20,000,000 have been invested in a fermentation process which yields no more than 0.1 per cent and sometimes as low as 0.005 per cent? Such is, in fact, the situation with penicillin production. This process is practical at the moment because of the unique clinical value of penicillin and because studies of its chemical constitution have not progressed sufficiently to give immediate promise of successful synthesis of it. Such synthesis, however, must remain an urgent objective for any useful product when yields from biological production methods are so extremely low.

Because of the relatively rudimentary state of the biological sciences in comparison with those of physics and chemistry, the manufacturer who employs biological agents such as the microbe inevitably finds himself faced from time to time with the unpredictable, the uncontrollable, the unknown. To draw another analogy from the horse, a modern farm tractor can, with suitable maintenance, give continuous service indefinitely, whereas the finest bred horse, even though given the best veterinary care, may succumb to disease.

Micro-organisms also suffer from disease, proving the old saw to the effect that "big bugs have little bugs upon their backs to bite 'em." Foremost among microbial diseases is bacteriophage, an ultramicroscopic entity which destroys bacteria by causing their lysis, or cellular disintegration. That organisms involved in industrial fermentations may be susceptible to phage was shown at the 1944 meeting of the Society of American Bacteriologists, where reports were presented on bacteriophage outbreaks in plants engaged in the acetone-butanol process and in the making of butylene glycol from wheat mash through the agency of *Aerobacillus polymyxa*. These reports showed that more than one strain of phage may be responsible for a given outbreak, so that the development of a nonlysogenic or phage-resistant strain of the desirable bacterium may require the finding of one immune to as many as four phage strains. Other measures effective against the bacteriophage were shown to be painstaking sterilization of equipment and substrate materials in the factory, and strict observance of aseptic techniques throughout the process.

Will the industrial fermentations maintain or better their currently dominant position in the making of essential chemicals, or will their heyday pass? To answer this question, let us examine and evaluate individual processes illustrative of either tendency.

A sphere in which chemical processes have largely superseded fermentation methods is the making of vitamins. For example, in 1939 when bakers first undertook vitamin enrichment of white bread, compressed yeast for their use was cultivated under special conditions to give it a thiamin potency sufficient to bring the thiamin level of

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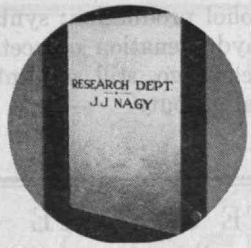

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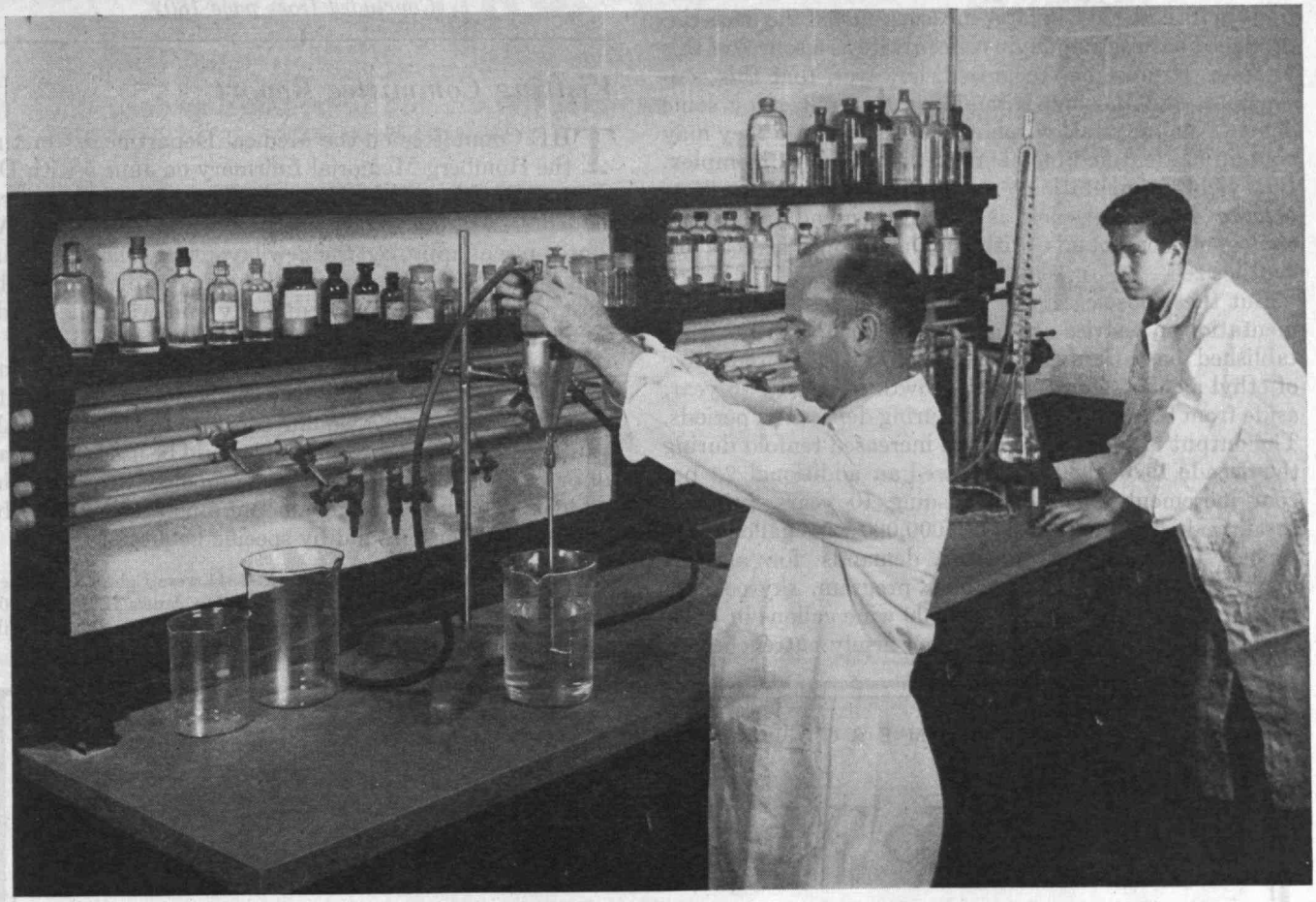

Keep a weather eye trained on the Sandee Research Staff. They will soon announce the first of a series of startling new developments in the field of Extruded Plastics. Here, trained technicians and modern facilities are constantly at work applying newly discovered principles for the creation of new products. Sandee also offers cooperation with research departments within and outside of the plastic industry to make better products with better processes in a more economical way.

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General Manager

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EXTRUDED PLASTICS AND SPECIAL TOOLS

MICROBES THAT WORK FOR MAN

(*Concluded from page 200*)

bread to approximately that of whole-wheat bread. As production of synthetic thiamin expanded and its price dropped correspondingly, it soon became cheaper to use this synthetic thiamin to enrich bread, and the special bakers' yeast was no longer made. Similarly, recent increases in the supply of synthetic riboflavin and reductions in its cost have in large measure ousted the bacteria-produced natural riboflavin concentrate as a source of this vitamin. It must be recognized, however, that this concentrate, and the high-vitamin yeasts, still enjoy some demand as "natural" vitamin sources, because they may contain unidentified members of the vitamin B complex. Low-yield fermentations, such as that of *Penicillium notatum*, become obsolete as soon as their end products or analogous compounds with similar properties can be synthesized.

But these obsolescent or insecure segments of the fermentation industries are quantitatively minor. Long established basic fermentations, such as that productive of ethyl alcohol, show healthy growth from year to year, aside from temporary setbacks during depression periods. The output of industrial alcohol increased tenfold during the decade 1920–1930, and showed an additional 25 per cent increment during the ensuing 10 years, bringing total production in 1940 to 126,000,000 wine gallons, 190 proof. Thereafter war-created demands for alcohol, mainly for the synthetic rubber program, skyrocketed output to an estimated 638,000,000 wine gallons in 1944. The fermentation method remains firmly entrenched as the important process for alcohol production; synthesis of this solvent by catalytic hydrogenation of acetaldehyde, which was developed years ago, still accounts for but a small fraction of the total output.

THE INSTITUTE GAZETTE

(*Concluded from page 180*)

Visiting Committee Report

THE Committee on the Medical Department * met at the Homberg Memorial Infirmary on June 5 with Dr. George W. Morse, the director. The extension and remodeling of the Infirmary had nearly been completed. All those present approved the new layout and the additional facilities to be made available. The new eye clinic will be most valuable to the student body and will indeed add significantly to the service of the Department.

Among recommendations formulated by the Committee in executive session was that thought be given to the idea of having an adequate separate fund which could be used, or the income from which could be used, to defray all or part of the medical expense for needy and worthy students. The present small amount might be increased by alumni contributions and by specific bequests.

* Members of the Committee for 1943–1944 were Egbert C. Hadley, '14, chairman, Dr. John A. Rockwell, '96, Dr. James H. Means, '06, Dr. Reginald H. Smithwick, '21, John E. Aldred, Dr. John F. Gile, and J. Willard Hayden.

RAILROAD COMFORT

(*Continued from page 177*)

into one another and the doors were left open. In Europe a hedge surrounds the house, the rooms are as far as possible isolated from one another, and the doors are kept carefully closed. The same custom is found in the preferential travel classes of Europe: Cars are subdivided into numerous small compartments.

In Europe the sleeping car — and travel comfort in general — made but indifferent progress; it is still considered a luxury. In America the Pullman fare is set no higher than a night's stay in the average hotel.

Retrospect

We have tried to explain American travel comfort in terms of its elements. We found these in different but interlocking spheres: the sphere of social attitudes and that of mechanized furniture — not to mention mechanization in air conditioning and sanitary facilities, which lie outside our picture.

American society of the railroad-building era was democratic in tone at a time when reaction governed European society. In Europe, that is to say, the upper classes walked amid every deference, while the common people had to put up with anything. This *democratic outlook* of the early years of American railroad building has been passed down to the modern European traveler in the continual perfecting of his comfort. Item by item, as they appeared, the improvements in travel comfort were taken over from America: in 1873, the sleeping car; in 1879, the "dining-room carriage," as the English called it; in 1889, the vestibule train.

(*Concluded on page 206*)

RAILROAD COMFORT

(*Concluded from page 204*)

Nowhere does this American democratic impulse show forth more clearly than in the strivings of the Fifties, in the efforts to make the railroad seat, the common railroad seat, adjustable to posture at all moments and even to make it transformable into a reclining chair or a couch. The stimulus came from the principle that each passenger is entitled to an equal place and an equal comfort. For this reason the period admitted but one travel class, a tradition still alive in the American coach class.

After the Civil War a change set in, with the appearance of Pullman and luxury in travel. It was still a democratization of comfort, yet, silently and without labels, it introduced a multiclass system in America. As time went on, increasing differentiation tended further and further in the direction of luxury.

The second source behind the comfort of American travel is the *mechanization of furniture*. Its elements are the convertible seat and the folding bed. They make possible the conversion of day quarters into night quarters, of living room into bedroom. The convertible seat and the folding bed belong to the family of patent furniture — to that furniture which is adjustable to posture by virtue of its mobility and to multiple function by its powers of mechanical metamorphosis.

References

[1] For insight into the financial manipulations involved, see the Chicago *Tribune*, September 22, 1875, quoted in Edward Hungerford, *Men and Iron; the History of New York Central* (New York, 1938), p. 274.

[2] Edward P. Mitchell, *Memoirs of an Editor* (New York, 1924), quoted *in extenso* in the *Pullman News*, Vol. XIII, No. 4 (April, 1935).

[3] United States Patents 89,537 and 89,538, April 27, 1869.

[4] Charles S. Sweet, in his "Sketch of the Evolution of the Pullman Car," distinguishes two Nineteenth Century styles: "the plain type ceiling of 1865–1892" and "the semi- and full-empire ceiling about 1893" — the heavily ornamented and vaulted ceiling.

[5] See Henry Havard, "Dictionnaire de l'ameublement et de la décoration depuis le XIIIe siècle jusqu'à nos jours" (Paris, 1890–1894), I:241–242. Wallace Nutting, writing in October, 1940, on "Double-Purpose Furniture," in *Antiques* (XXXVIII: 160) mentions the fact that "in 1770 Oliver Goldsmith wrote of a piece of furniture that was a bed at night and a chest of drawers by day."

[6] United States Patent 668, Wardrobe Bedstead, April 2, 1838. Cf. also United States Patent 23,604, Improved Wardrobe-Bed (Fig. 8), April 12, 1859.

[7] United States Patent 97,101, Combined Bed and Musical-Instrument Board, November 23, 1869. There is quite an early drift toward this dubious field of dummy furniture. Yet constituent problems still hold the foreground. Occasionally, in the wane of the period, mimicry falls into the absurd, as with the bed whose daytime envelope is a chimney: United States Patent 334,504, Combined Bedstead and Fire-place, January 19, 1886.

[8] United States Patent 56,413, Improved Combined Piano, Couch, and Bureau, July 17, 1866.

[9] Leaflet of the Pullman Company.

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TECHNOLOGY MEN IN ACTION

THE ALUMNI FUND — ITS PROBLEMS AND GROWTH

Nineteen Forty-Four!

A YEAR to be remembered by some, forgotten by others. . . . A year that will loom large in the pages of history. . . .

The magnitude of events of the past 12 months makes it seem almost presumptuous to list, among accomplishments of importance, the progress of our Alumni Fund. And yet, to the future of the Institute, it *is* truly important. Consider it for a moment in a new light.

Our goal of $150,000 means an annual gift of some $100,000 to the Institute. At the present rate of return this is the equivalent of an increased endowment of over $3,000,000, truly a substantial and worth-while objective!

How close are we to this goal? Well, we've been getting nearer and nearer each year. Last year, for example, we exceeded $115,000, which is 77 per cent. And this year we had already bettered that figure by early December. The Fund year does not come to an end until March 31, so if you have not yet done your part, won't you do so now? We *can* make it this year!

No Change

— in the line-up, at any rate. The Club Sweepstakes has settled down into a race where the only changes are numerical. The order remains just the same as it was last month.

Here's a new figure, though, that will have some interest. The clubs as a whole have 42 per cent of contributors, and the over-all average is $15.50. Compare these with the general alumni figures at the bottom of the page. Not bad!

	Per cent of Contributors *	*Average Contribution*
Pittsburgh	67	$15.90
Providence	59	14.40
Newark	57	13.80
Philadelphia	52	17.80
Cincinnati	38	11.10
Buffalo	35	14.80
Harrisburg	34	10.90
Chicago	32	15.30
Kansas City	30	40.60
Dallas	25	10.40
Alumni Body as a whole	27	$13.15

* Based on number of active members.

TECHNOLOGY MEN IN ACTION

M.I.T. MEN AT WAR

Up to December 7 over 6,765 Institute Alumni, including 28 Admirals, 1 Commodore, and 80 Generals, were recorded as being in the active naval or military services of the United Nations. Among the new additions this month are Brig. Gen. Joseph S. Bradley '28, Brig. Gen. Rolland V. Case '20, Brig. Gen. David N. Hauseman '28, Brig. Gen. Henry J. D. Meyer '32, Brig. Gen. Ernest Moore '37, Brig. Gen. Hugo P. Rush '29. There were 124 Alumni who had been decorated, and 85 who had made the supreme sacrifice.

Additions and corrections to the listings which have previously appeared, beginning two years ago with the issue of November, 1942, will continue to be published in future issues of The Review. As a matter of convenience, promotions and corrections in the rank previously given are grouped under a single heading, "Changes in Rank." The Review Editors are greatly indebted to the many Alumni and other readers who are continuing to co-operate so helpfully in reporting inevitable errors of omission and commission which they note in these listings.

NEW DECORATIONS

1918 Chamberlain, Samuel V., *Maj.*, U.S.A., Legion of Merit — for exceptionally meritorious conduct in the performance of outstanding services in North Africa and Italy in securing valuable information for the preparation of three instructive publications.

1920 Bradshaw, Aaron, Jr., *Brig. Gen.*, U.S.A., Legion of Merit.

1921 Brady, Edmund E., Jr., *Capt.*, U.S.N., Legion of Merit.

1922 Dunkelberg, Wilbur E., *Brig. Gen.*, U.S.A., Legion of Merit.

1923 Deitrick, Carroll H., *Col.*, U.S.A., Distinguished Service Medal.

★Mullinnix, Henry M., *Rear Adm.*, U.S.N., Legion of Merit.

1927 Waugh, Sidney B., *Capt.*, U.S.A., Croix de Guerre — for service as officer in charge of Military Government attached to a French Unit in the Italian Campaign.

1929 Clexton, Edward W., *Capt.*, U.S.N., Legion of Merit.

1931 Westphalinger, Henry R., *Col.*, U.S.A., Legion of Merit.

1933 Billingsley, John D., *Col.*, U.S.A., Legion of Merit.

1936 Blaisdell, Kenneth L., *Capt.*, U.S.A., Legion of Merit.

1939 Kapchus, John F., *Capt.*, U.S.A., Air Medal.

1941 ★Doughten, William S., Jr., *Lt.*, U.S.A., Presidential Citation, posthumously.

1942 DeLeo, Felix R., *Capt.*, U.S.A., Bronze Star.

Downing, Albert G., *Capt.*, U.S.A., Bronze Star — for heroic achievement in connection with military operations against the Japanese on Kwajalein Island.

Goldis, Alfred, *Capt.*, U.S.A., Silver Star; Distinguished Flying Cross; Air Medal and several Oak Leaf Clusters.

Vyverberg, Robert G., *Lt.*, U.S.N., Bronze Star — for aiding in sinking numerous ships while on submarine war patrols.

2–44 Looker, Edward C., Jr., *Lt.*, U.S.A., Air Medal with Oak Leaf Clusters; Presidential Citation.

NEW COMMENDATION

1930 Buracker, William H., *Capt.*, U.S.N., Letter of Commendation from Secretary of the Navy for services as C.O. of Naval Air Training Center and Naval Air Station, Pensacola, Florida.

NEW LISTINGS

U.S.A.

1914 Baird, Lyman S., *Capt.*
1922 Phelan, Thomas E., *Corp.*
1928 ‡McCabe, Francis W., *1st Lt.*
Ryan, James E., *Capt.*
1929 Aldrich, Lewis R., Jr., *T.Sgt.*
1930 Nance, Robert H., *Corp.*
1931 Otis, William H., *Capt.*
1933 Hadlock, Canfield, *Maj.*
1934 Morrison, Lawrence A., *1st Lt.*
1935 Hunt, Charles J., Jr., *S.Sgt.*
Stanfield, Richard E., *Maj.*
1938 Schmitt, Frederick G., Jr., *Lt. Col.*
1939 Kapchus, John F., *Capt.*
1940 Crawford, Douglas W., *O.C.*
1942 MacGillivray, Daniel J., Jr., *A.C.*
Powers, John W., *Pvt.*
Reiche, Ludwig P., *Pvt.*
Staff, Robert E., *1st Lt.*
1943 Bright, William J., 3rd, *Lt.*
del Valle, Angel A., *2nd Lt.*
2–44 Kaesche, William C., *Pvt.*
Maher, Robert D., *Pvt.*
Nagy, Bertram F., *2nd Lt.*
Schaefer, Joseph J., Jr., *Pvt.*
Teixeira, Newton A., *2nd Lt.*
10–44 Acebes, Hector R., *Pvt.*
Adams, Charles A.
Adams, John S., *Pvt.*
Ahearn, John L., Jr., *Pfc.*
Amthor, Franklin R., Jr., *A.C.*
Anderson, Oiva, R., *Corp.*
Anderson, Paul N., Jr., *Pvt.*
Aquadro, Robert A., *Pvt.*
Aronsen, Arthur N., *2nd Lt.*
Asher, Gifford W., *2nd Lt.*
Ashley, Eugene, *Pvt.*
Atwood, Donald J., Jr., *Pvt.*
Auty, Robert P., *2nd Lt.*
Bachmann, Woodward D., *2nd Lt.*
Bajor, Menceslaus J., *Pvt.*
Baker, Joseph S., Jr., *A.C.*
Baker, Paul H., *Pvt.*
Balluffi, Robert W., *Pfc.*
Bamber, William H., *Cadet*
Barber, James L., *2nd Lt.*
Baring, John A., *Pfc.*
Barnes, Robert S., Jr., *Pvt.*
Barrows, Thomas S., *Pfc.*
Barton, William A. H., Jr., *Pvt.*
Barton, William W., *A.C.*
Battiato, Joseph S., *Pfc.*
Baum, Alfred G., *Pvt.*
Bell, Edwin S., *Pvt.*
Bell, Thomas L., Jr., *Pvt.*
Bent, Gardner L., *Pvt.*
Bernheim, Samuel L., *Pvt.*
Bernstein, Everett M., *Pvt.*
Bertolet, William H., 3rd, *Lt.*
Bing-You, Harry, *Corp.*
Boreham, Howard B., *Pvt.*
Bossi, Enea W., *Pvt.*
Boyd, William M., *A.C.*
Branker, Richard A., *Pfc.*
Bresler, Richard H., *A.C.*
Bressler, Clarke S., Jr., *Pvt.*
Bretschger, Alfred M., *Pvt.*
Brewster, Frank M., 2nd, *Lt.*
Brooks, Edward, Jr., *Pfc.*
Brown, Norman L., *Pfc.*
Brown, William P., *S.Sgt.*
Bruce, Robert V., *Pvt.*
Brush, Carey W., *Sgt.*
Buck, Thomas F., *Pfc.*
Burbank, James C., *Pfc.*
Burgess, Charles W., *Pfc.*
Burgwardt, M. Roy, *Pvt.*
Burke, James C., Jr., *A.C.*
Burmaster, Charles A., *Lt.*
Burstan, Rupert C., *Pfc.*
Burton, Harold E., *Sgt.*
Button, Lawrence N., *Pfc.*
Caldwell, Walter H., *Pfc.*
Callejas, Peter, *Pfc.*
Cantor, Jacob D., *Pfc.*
Childerhose, John V., *Pvt.*
Christiansen, Roger N., *Pvt.*
Clark, Geoffrey, *S.Sgt.*
Clayton, Walter A., *2nd Lt.*
Clifford, George F., *Pvt.*
Coan, Edward M., *Pvt.*
Collier, William H., *1st Lt.*
Colton, John W.
Connell, Walter R., Jr., *2nd Lt.*
Connors, James J., Jr., *Pvt.*
Connors, John W., *A.C.*
Cook, Paul M., *Pvt.*
Cooley, James L., *2nd Lt.*
Coombs, Alexander W., *Pvt.*
Coppins, William J., *A.C.*
Corso, Joseph T., *Pfc.*
Cox, Allen E., *Pvt.*
10–44 Craig, Lee M., *Pvt.*
Crooks, Robert G., *A.C.*
Cruckshank, Paul K., *Pvt.*
Curran, George P., Jr., *Pvt.*
Cutter, Henry T., Jr., *Pvt.*
DaCorte, Joseph V., *Pvt.*
Daneman, John P., *Cadet*
Danner, Robert F., *Pvt.*
Davis, Peter J., *Pvt.*
Davis, Theodore, *Pfc.*
Davisson, Alan T., *Pvt.*
Dearborn, George L., *Pvt.*
DeGeorge, Peter J., *Pvt.*
DeGuzzie, Everett T., *Pvt.*
Dengler, Carl E., *Pvt.*
Devaney, Joseph J., *Pvt.*
Devine, Robert L., Jr., *Pfc.*
Dieckmann, Steffen F., *Pfc.*
Dimodica, John F., *Pvt.*
Dolan, Thomas J., *2nd Lt.*
Donahue, Joseph M., *Cadet*
Dorste, Thomas C., *Pvt.*
Drottar, Kenneth R., *Corp.*
Dubois, Jacques E., *2nd Lt.*
Duff, Barrett S., *Lt.*
Dundon, George S., *Pvt.*
Dunwiddie, Alan W., Jr., *Pvt.*
Ebersberger, John J., Jr., *Pfc.*
Eich, Edward D., *Pvt.*
Emerson, Edward E., *Corp.*
English, Wallace A., *Pvt.*
Ericson, John W.
Erikson, Carl G., Jr., *Pvt.*
Everett, Norman A., *Pfc.*
Farmer, Harlow G., Jr., *Pvt.*
Fernandes, Harold, *Corp.*
FitzGerald, James H., Jr., *Pvt.*
Follett, Warren S., *A.C.*
Fowle, Arthur A., *Pvt.*
Freund, Walter J., Jr., *Pfc.*
Fries, John E., Jr., *Pvt.*
Frodey, Ray C., *Pvt.*
Galeski, Edward W.
Gall, John C., *Pvt.*
Gassaway, James M., 2nd.
Gechijian, Haig G., *Pfc.*
Giori, Francis A., *Pvt.*
Gist, William B., Jr., *Pfc.*
Goetze, Dieter, *Pvt.*
Goldman, Richard G., *Pvt.*
Goldson, John D., *Pvt.*
Goodnow, Weston W., Jr., *Pvt.*
Gordon, Philip D., *Pvt.*
Gore, Richard B., *Pvt.*
Grassi, Donald S., *Pvt.*
Gray, Arthur, Jr., *2nd Lt.*
Greene, Edwin B., *Pvt.*
Gregg, Richard T., *Pvt.*
Guild, Robert R., *Pfc.*
Gurney, James L., *Pvt.*
Gwillim, Russell A., *Pvt.*
Haas, Martin L., *2nd Lt.*
Hair, Vincent W., *A.C.*
Halbleib, William F., *Pvt.*
Ham, Clifford C., Jr., *Pvt.*
Hann, Vincent R., *Pfc.*
Hanower, Lee, *Pvt.*
Hanson, Potter, *Pvt.*
Hart, William J., *Pvt.*
Hawley, William G., *Pvt.*
Herb, John W., *Lt.*
Heuchling, Frederick G., Jr., *Pvt.*
Hoehn, Scott J., *Pvt.*
Hogg, Theodore B., Jr., *Pvt.*
Hollander, Stanley N., *Pvt.*
Holt, Francis S., Jr., *Pvt.*
Hong, Sam H., *Pvt.*
Horn, Robert J., Jr., *Pvt.*
Horstkotte, Frederick W., Jr., *Pvt.*
Hossfield, Theodore C., *2nd Lt.*
Hossfield, George L., Jr., *2nd Lt.*
Huddleston, Frank J., *Pvt.*
Hunter, John P., Jr., *Pvt.*
Hyde, William B., *2nd Lt.*
Ihde, William M.
Iskra, Frank J., *Pvt.*
Jackson, Thomas S.
Jacobsen, Erling R.
10–44 Jahn, Robert C., *Pfc.*
Jannetti, James E., *A.C.*
Jay, Theodore C., Jr., *Pvt.*
Jennings, George N., *Corp.*
Jennis, Irwin M., *A.C.*
Johnson, Clare P., Jr., *Pvt.*
Johnson, Warren E., *2nd Lt.*
Judge, Martin B., *Pvt.*
*Juliano, Louis W., *1st Lt.*
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Katz, William E., *Pvt.*
Kautz, William H., *Pvt.*
Kawecki, John E., *Pvt.*
Keller, George M., Jr., *Pvt.*
Kelley, James E., *Pvt.*
Kelley, Raymond F., Jr., *2nd Lt.*
Kellogg, John H., Jr., *Pvt.*
Kelly, Joseph V., Jr., *Pvt.*
King, Stephen B., *Pvt.*
Klausmeier, Robert L., *Pfc.*
Klug, Carl M., *Pvt.*
Knapp, Harold A., Jr., *Pfc.*
Knight, Richard A., *A.C.*
Knutzen, Keith, *Corp.*
Kobick, David G., *Pvt.*
Kordys, Stanley C., *Pvt.*
Krutzsch, William C., Jr., *Pvt.*
Kuebler, Thomas L., *Pvt.*
Kuljian, Arthur H., *Pvt.*
Lagana, Michael P., *2nd Lt.*
Lally, Vincent E., *A.C.*
Lane, Frank G., *Pvt.*
Langtry, Bertrand D., *Pvt.*
LaRue, John P., *Pvt.*
Lawton, Russell E., Jr., *Pvt.*
Leonard, James A., *Pvt.*
Levy, Edwin S., *Pfc.*
Lewis, Morton V., *Pvt.*
Lighthall, Harry, Jr., *Pfc.*
Lockwood, William A., *Pvt.*
Long, Matt R., Jr.
Lord, Daniel F., *Pvt.*
Los, Nicholas C., *Sgt.*
Loucks, Charles P., *Pvt.*
Loufek, Charles W., Jr., *Pvt.*
Loven, Arthur C. E., *Pvt.*
Lull, David B., *Pvt.*
Lurie, Henry A., *Pvt.*
Lustberg, William M., *Pfc.*
Lynch, Joseph M., Jr., *Corp.*
Lyon, Robert E., *Pvt.*
Macdonald, Ian H., *Pvt.*
McDonnell, Charles H., Jr., *Pvt.*
McEvoy, Thomas M., Jr., *2nd Lt.*
MacLean, Alan L., *Pvt.*
Maher, Francis R., Jr., *Pvt.*
Matson, Clifford H., Jr., *Pvt.*
Mazur, Robert H., *Pvt.*
Means, Max F., *Pvt.*
★Sherwood, Philip B., *Lt.*

(Note: Remainder of 10–44 listings will appear in February issue.)

U.S.N.

1927 Jacobsen, John E., *Lt.*
1928 Houpis, John G., *Lt. Comdr.*
1929 Donahue, Paul F., *Lt. (j.g.)*
1930 Goeller, Charles P., *E.M.1c.*
1932 Fahey, Joseph P., *Lt. (j.g.)*
1938 Kingsbury, Robert J., *Ens.*
MacKenzie, Ian M., *Ens.*
Main, Archibald M., Jr., *Ens.*
1939 Ellis, Forrest T., Jr., *Ens.*
1940 Richardson, Spencer M., *A.S.*
1941 Fry, Sam, *Ens.*
Pohndorf, Henry L., *Ens.*
1942 McConnell, Douglas D., Jr., *Ens.*
Meurk, Carl R., *Ens.*
Nordin, Theodore P., Jr., *Ens.*
1943 Firth, Lewis G., Jr., *Lt. (j.g.)*
2–44 Chamberlain, John, *Ens.*
Damsgaard, Kjeld, *A.S.*
Davey, Francis H., *Ens.*
Elden, Richard E., *S.1c.*
Funk, George E., *Ens.*
Gallivan, James E., Jr., *S.1c.*
Martin, Arnold W., *Ens.*

2–44 Noyes, Henry P., *S.1c.*
Soderberg, Carl R., *Ens.*
Tucker, Beverley B., *Ens.*
10–44 Arnold, Charles E.
Ashley, Donn L., *Mid.*
Atkinson, Albert R., *A.S.*
Bailey, David Z.
Bennett, Frederick G., *Comdr*
Biondi, Manfred A., *Mid.*
Bishop, Paul L.
Brindis, Leslie M.
Brown, Roland B., *S.1c.*
Bryant, Arthur L., *A.S.*
Butter, George A., Jr.
Caldwell, Gordon P., *S.1c.*
Carpenter, Fontinelle S., Jr.
Chenault, Frederic A., *Comdr.*
Chisholm, Donald M., *Lt. Comdr.*
Christopher, Joseph A., *Mid.*
Conlin, John A.
Cooley, William C., *A.S.*
Cooper, George R., Jr., *A.S.*
Costello, Edward J., *Mid.*
Cross, Richard F., 3rd.
Dakos, Demosthenes P., *Mid.*
Dean, John E., *A.C.*
Dinsmore, John R., *Lt.*
Dodds, Robert P., *Mid.*
Dolan, John W., Jr., *Lt. Comdr.*
Donaldson, Thomas M.
Dunford, James M., *Lt. Comdr.*
Evans, Ralph L., Jr., *A.C.*
Fabens, Henry B., *A.S.*
Faber, Frederick R.
Farmer, Franklin R., *A.S.*
Frailey, Jack H., *A.S.*
Furlong, Donald, *Lt.*
Gillooly, Robert P.
Gonseth, Richard F., *A.C.*
Granlund, John, *A.S.*
Gray, Walter H., Jr., *A.S.*
Guptill, Frank E., Jr., *S.2c.*
Healy, James J.
Hield, James F.
Hill, Peter F., *A.C.*
Hobbs, Walter, Jr., *A.C.*
Holbrook, Keith R., *P.O.3c.*
Hooper, Frederic A., *Lt. Comdr.*
Horrigan, Robert V., *A.S.*
Hull, John L., *A.S.*
Hunt, Austin T., Jr., *A.S.*
Hunter, Robert L.
Hushing, William C., *Lt. Comdr.*
Jester, Malvern H. L., *Mid.*
Judd, Hubert M., *Mid.*
Kalb, William P.
Keefe, John R., *Ens.*
Kirkham, Thomas A., Jr., *Aer. M.3c.*
Krulee, Gilbert K.
Lamberton, Bruce A., *A.S.*
Laney, Robert V., *Lt.*
Lester, Joseph T.

(Note: Remainder of 10–44 listings will appear in February issue.)

U.S.C.G.

10–44 Daniels, Milton R., Jr., *Ens.*
Johnsen, Arthur W., *Lt. Comdr.*
McIntosh, James, *Lt. Comdr.*

U.S.M.C.

1933 Ashworth, Bentley P., *Lt.*
10–44 *Burke, John F., *2nd Lt.*
Cantor, Herbert W., *Pvt.*
Ehrat, Alfred J., *Pvt.*
Gill, Stephen M., *Pvt.*
Gordon, Gerome, *Pvt.*
Hanson, John H., *Pvt.*
Hanstein, Walter, *Pvt.*
Hoadley, David A.
Kelly, Thomas K., *Pvt.*
Kotlin, James J., Jr., *Pvt.*
Staros, Anthony, *Pvt.*
Stevens, John B., Jr., *Sgt.*
Stevenson, Donald T., *Pvt.*
Thoolen, Sven I., *Pvt.*
Vance, Rowland B., *1st Lt.*
Vercoe, Maurice C., *Pvt.*

CANADA

Army

10–44 Nightingale, William E.

Navy

1943 Evans, Maurice R., *Lt.*
2–44 Fraser, William M., *Sub. Lt.*
10–44 German, John G., *Sub. Lt.*

BRAZIL

Navy

10–44 Gomes Filho, Iramaia, *Lt. Comdr.*
Lobo e Silva, Ranato L., *Lt.*
Pereira Pinto, Francisco F.
Santos, Armando, *Capt.*

GREECE

Navy

10–44 Polemis, Augustus, *P.O.*

NEW ZEALAND

Army

10–44 Baker, Roy R., *A.C.*

NORWAY

Army

10–44 Lorentzen, Erik F., *Pilot*

Navy

1942 Maartman-Moe, Ragnvald, Jr., *Lt.*

CHANGES IN RANK

U.S.A.

1920 Case, Rolland V., *Col.* to *Brig. Gen.*
1921 Bartlett, Boyd W., *Lt. Col.* to *Col.*
1926 Nelson, Donald S., *Lt.* to *Capt.*
1927 Thomas, Gordon E., *Maj.* to *Lt. Col.*
1928 Bradley, Joseph S., *Col.* to *Brig. Gen.*
Hauseman, David N., *Col.* to *Brig. Gen.*
1929 Rush, Hugo P., *Col.* to *Brig. Gen.*
1931 Cleveland, John M., *Pvt.* to *2nd Lt.*
Kennedy, John J. Jr., *Lt.* to *Capt.*
Westphalinger, Henry R., *Lt. Col.* to *Col.*
1932 Lowery, G. Arthur, *Capt.* to *Maj.*
Meyer, Henry J. D., *Maj.* to *Brig. Gen.*
Osborne, Ralph M., *Lt. Col.* to *Col.*
1933 Beldon, Morris C., *Capt.* to *Maj.*
Billingsley, John D., *Lt. Col.* to *Col.*
Green, Maurice G., *Capt.* to *Maj.*
Herlich, Benjamin, *Capt.* to *Maj.*
Hopkins, John R., *Capt.* to *Maj.*
Regan, John W., Jr., *Maj.* to *Lt. Col.*
Smith, Raymond W., *Maj.* to *Lt. Col.*
Taul, Horace W., *Capt.* to *Lt. Col.*
1934 Coleman, William E., *Capt.* to *Maj.*
Frank, Louis, *Maj.* to *Lt. Col.*
1935 Golden, Gerald M., *1st Lt.* to *Capt.*
Stern, Julius, *Capt.* to *Maj.*
1936 Farmer, Daniel E., *Lt.* to *Capt.*
Mustoe, Anthony Q., *Lt.* to *Col.*
Rapoport, Emanuel, *O.C.* to *Sgt.*
1937 Dantona, Leo R., *Lt.* to *Capt.*
de Raismes, Robert E., Jr., *Capt.* to *Maj.*
Kierstead, Fred D., *Lt.* to *Capt.*
Moore, Ernest, *Lt. Col.* to *Brig. Gen.*
1938 Brown, Staunton L., *Lt. Col.* to *Col.*
Flanagan, Robert, *Lt.* to *Capt.*
Mullins, Clayton E., *Lt.* to *Col.*
1939 Hansen, Floyd A., *Lt. Col.* to *Col.*
Morrill, Manning C., *Lt.* to *Capt.*
Plunkett, Robert, *Lt.* to *Capt.*
Salmon, John L., *Pvt.* to *2nd Lt.*
1940 Carson, Knight S., *Capt.* to *Maj.*
Churchill, Delos B., *Lt.* to *Capt.*
Clark, William L., *Maj.* to *Lt. Col.*
Ellis, James O., *Lt.* to *Capt.*
Goldberg, Louis G., *Capt.* to *Maj.*
McCaul, Gerald J., *Lt.* to *Capt.*
Read, John W., *Lt.* to *Capt.*
Seedlock, Robert F., *Lt. Col.* to *Col.*
1941 Alpert, Leo, *Capt.* to *Maj.*
Andino, Jose A., *Capt.* to *Maj.*
Avery, Henry, *1st Lt.* to *Capt.*
Banks, Harold C., *Lt.* to *Maj.*
Burnett, Sherwood G., *Lt.* to *Maj.*
Cartwright, Everett J., *Capt.* to *Maj.*
Porter, John M., *Lt.* to *Capt.*
Sheridan, Edward W., *Capt.* to *Maj.*
1942 Carroll, Thomas S., *Capt.* to *Maj.*
Graham, Arthur, *2nd Lt.* to *1st Lt.*
Groves, Quentin D., *Pvt.* to *T.4.*
Hamlin, William G., *Pvt.* to *2nd Lt.*
1943 Young, Henry T., *2nd Lt.* to *1st Lt.*
2–44 Beckington, Arthur R., *Pvt.* to *Lt.*
Burdakin, John H., *Pvt.* to *Lt.*
Cochran, Edward W., *O.C.* to *2nd Lt.*
Ingham, George A., *Corp.* to *Sgt.*
Mackintosh, Arnold, Jr., *Pvt.* to *2nd Lt.*
2–44 Morgan, Thomas H., *Pvt.* to *2nd Lt.*
White, John A., *Pvt.* to *1st Sgt.*

U.S.N.

1918 Flint, James A., *Comdr.* to *Capt.*
1921 McDowell, Ralph S., *Comdr.* to *Capt.*
Vickery, Howard L., *Rear Adm.* to *Vice Adm.*
1926 McFarland, Clifton B., *Lt. Cmdr.* to *Comdr.*
Richardson, Robert W., *Lt.* to *Lt. Comdr.*
1927 Hofman, Erik, *Lt. Comdr.* to *Comdr.*
1929 Gale, Walter H., *Lt.* to *Lt. Comdr.*
1932 Chaplik, Alexander J., *Lt. (j.g.)* to *Lt.*
Honsinger, Leroy V., *Lt.* to *Comdr.*
Paris, Nathan, *Lt. (j.g.)* to *Lt.*
1933 Buerger, Newton W., *Lt.* to *Lt. Comdr.*
Saslaw, Samuel S., *Lt.* to *Lt. Comdr.*
1936 Schliestett, George V., *Lt.* to *Lt. Comdr.*
1938 Eaton, William E., Jr., *Ens.* to *Lt.*
Madden, Robert B., *Lt.* to *Comdr.*
Minott, Albert W., *Ens.* to *Lt. (j.g.)*
1939 DeTiere, Elmer F., Jr., *Ens.* to *Lt. (j.g.)*
1940 Dorsett, John O. F., *Lt.* to *Comdr.*
Higgins, Arthur T., *Lt.* to *Lt. Comdr.*
Mustin, Lloyd M., *Lt. Comdr.* to *Comdr.*
Robb, Budd R., *A.S.* to *S.2c.*
1941 Collins, Ivor W., Jr., *Ens.* to *Lt.*
Fernandez, Raymond C., *Lt. (j.g.)* to *Lt.*
Hoffman, Edmund J., *Lt.* to *Comdr.*
1942 Andrew, William G., Jr., *Lt. (j.g.)* to *Lt.*
Coe, Jerome T., *Ens.* to *Lt. (j.g.)*
Denney, George C., Jr., *Ens.* to *Lt.*
Meehan, Joseph P., Jr., *Ens.* to *Lt.*
Smith, Tracy, Jr., *Ens.* to *Lt.*
1943 Casserly, James R., *Ens.* to *Lt. (j.g.)*
Gayton, John E., *Ens.* to *Lt. (j.g.)*
Nelson, George L., *Ens.* to *Lt. (j.g.)*
2–44 Jefferson, Edward, 2nd, *Mid.* to *Ens.*
Kispert, Malcolm G., *Mid.* to *Ens.*

CANADA

Navy

1929 Bolton, Richard E., *Lt.* to *Lt. Comdr.*

RANKS NOT PREVIOUSLY PUBLISHED

U.S.A.

2–44 Almeida, Americo F., Jr., *Lt.*
Fowler, Paul I., *Lt.*
Hopkins, William R., *Lt.*
Ilfield, Robert M., *Pvt.*
Reid, William C., *Corp.*
Skelskie, I. Stanley, *Lt.*

CASUALTIES

1923 ★Mullinnix, Henry M., *Rear Adm.*, U.S.N. (Previously reported Missing in Action after the sinking of the carrier, *Liscome Bay.*)
1925 *McGinnis, Francis W., *Lt.*, U.S.N. — plane crash November 24, 1943, while on a confidential mission.
★Parkinson, Roger W., *Lt. Col.*, U.S.A. — September 26, 1944 — Holland
1937 †Kendzur, Max S., *Lt.*, U.S.A.
1939 *Hall, Leigh S., Jr., *Lt.*, U.S.A. — Plane Crash, October 30, 1944 — Wright Field
1940 ★Johnson, Malcolm E., *Lt.*, U.S.A.
1942 ‡Pentz, Arthur H., *1st Lt.*, U.S.A. — Germany
1943 ★Smith, G. H. Miller, *2nd Lt.*, U.S.A. — France
2–44 †McCandliss, Robert K., *2nd Lt.*, U.S.A. — Germany
10–44 *Burke, John F., *2nd Lt.*, U.S.M.C. — Plane Crash
★Sherwood, Philip B., *Lt.*, U.S.A. — while returning from a raid over Europe.

Dr. Compton's V-Mail Christmas Letter to "M.I.T. Men at War"

* * *

Christmas Greetings from the Institute!

Again I have the privilege of sending a message on behalf of M.I.T. — alumni, staff and students — to you, its sons, in the Armed Forces. Since my letter a year ago our nation has come far closer to victory, and therefore to your return, and to the chance for all of us to get at the things we want to be doing in peace. For this, at this Christmas season, we are thankful.

There are 7,900 of you in service (6,400 alumni and 1,500 students); 175 of our faculty are on leave of absence for war work; 4,500 persons are engaged on our campus in developing new devices for military use; 1,800 Army and Navy personnel are here receiving intensive training for technical service in the war; this, together with alumni in war industry, is the picture of the Institute's war contribution.

Rear Admiral Cluverius delivered our last Baccalaureate address on the subject, "Every Man in His Place," from the story of Gideon. To you, every man in his place, the Institute turns today with confidence, pride and affectionate best wishes.

★ Killed in Action † Missing in Action ‡ Prisoner of War * Died or killed in Service ** Wounded

ALUMNI AND OFFICERS IN THE NEWS

In Black and White

¶ "Economic Factors in the U. S. Phosphate Industry," by BERTRAND L. JOHNSON '05 in *Mining and Metallurgy* for October.

¶ "The Balmville Tree," by THOMAS C. DESMOND '09 in *American Forests* for November.

¶ "Peacetime Markets for Chemicals: The Leather Industry," by KENNETH E. BELL '17 in *Chemical Industries* for October.

¶ "Vanadium on the West Coast of British Columbia," by HENRY C. GUNNING '26 and Donald Carlisle in the *Canadian Mining and Metallurgical Bulletin*, No. 391, for November.

¶ "Resorcin Resins and Adhesives," by PHILIP H. RHODES '35 in *Modern Plastics* for December.

¶ "Division of Industrial Hygiene," by AUGUST T. ROSSANO, JR., '38 in the Colorado State Board of Health *Bulletin* for October.

¶ "Cable Calculations for Shipboard Power and Lighting Systems," by BERNARD F. GREENBERG '40 in the *Journal* of the American Society of Naval Engineers for August.

¶ "There's Always a Way," by JAY ZEAMER, JR., '40 in the *American* for January.

The Fortunes of War

¶ Find ROGER L. PUTNAM '17 in the new Office of Contract Settlement, trying to cut to the minimum the time allowed between receipt of each manufacturer's inventory and the clearing out of government tools and stock by the procurement agencies, to permit a prompt return to former production.

¶ Assigned WILLIAM A. SULLIVAN '17 the task of making the port of Cherbourg serviceable in the shortest space of time, thereby forwarding Allied victories in France and Germany by assuring a steady stream of supplies.

¶ Have given ASA W. K. BILLINGS '26 the rule of the little German town of Rotgen, and the surrounding area, as Allied military governor.

¶ Discover OSCAR S. COX '27 as general counsel of the Foreign Economic Administration taking an important part in planning the demobilization of Germany.

¶ Forced WALDO I. KENERSON '29 to supervise destruction of the Kweilin, China, air base, situated in the same area where, as district engineer, he had organized the tedious building of United States bases with only the hand labor of thousands of Chinese farmers in place of machinery.

¶ Prompted PETER S. HOPKINS 2–44 to "blow the top off the Gibraltar of the Burma Road." Captain Hopkins directed Chinese soldiers in tunneling into the mountain and placing TNT under the Japanese positions at Sungshan, one of the main objectives of the Salween River offensive.

¶ Inspired DAVID W. VIGODA '46 to design "a simple, yet sensitive and accurate device for balancing dynamotor armatures," now in actual operation somewhere in England in the signal maintenance section of an aircraft repair and modification depot of the Air Service Command.

In High Esteem

¶ For civil engineering in many lands beside his own — Curaçao, Colombia and other South American countries, Liberia, Turkey, Japan, China, and the Dutch East Indies — WILLIAM V. MCMENIMEN '03 "will receive the 1945 award of the Moles, an organization of heavy construction experts, for outstanding contribution to construction progress."

¶ For 25 years of service as manager of the South Boston refinery of the American Sugar Refining Company, RUFUS C. FOLSOM '08 was honored by 220 of his fellow employees at a dinner at the Hotel Statler on November 13.

¶ For their paper on the gas turbine, as the best contribution during 1943, C. RICHARD SODERBERG '20, jointly with Ronald B. Smith, received the Linnard Prize of the Society of Naval Architects and Marine Engineers.

DEATHS

** Mentioned in class notes.*

¶ LOTHROP H. FAULKNER '75, June 12.
¶ BENJAMIN C. MUDGE '77, November 23.*
¶ ALBERT P. CONE '85, April 30.*
¶ HARRY G. FROST '85, July 6.*
¶ CALVIN W. MCFERRAN '85, March 12.*
¶ WILLIAM H. OSGOOD '85, July 18.*
¶ FREDERICK B. RICE '85, August 27, 1939.*
¶ ROBERT E. RICHARDSON '85, October 11.*
¶ CHARLES S. ROBINSON '85, August 1.*
¶ ALBERT L. CUSHING '87, October 25.
¶ ARTHUR C. SPRAGUE '87, November 15.
¶ ALBERT J. PERKINS '88, November 20.
¶ ALONZO J. HAMMOND '91, December 1.
¶ THADDEUS S. WELCH '91, February 29.*
¶ LEO GOODKIND '92, December 14, 1943.
¶ LAWRENCE W. CASE '93, February 16.*
¶ HOWARD A. GILSON '93, January 13.*
¶ WILLIAM H. GRAVES '93, September 19, 1943.*
¶ JAMES R. SPEER '93, October 1.*
¶ SAMUEL E. WHITAKER '93, August 10.*
¶ THEODORE VARNEY '94, October 2.
¶ WATSON E. GOODYEAR '95, September.
¶ WILLIAM F. PATTEN '95, November 1.*
¶ EDWARD P. SCHOENTGEN '95, October 17.*
¶ DAVID W. BEAMAN '96, October 31.*
¶ JOHN T. ALDEN '97, September 28.*
¶ BERNARD BARROWS '97, October 20.*
¶ GEORGE H. BLISS '97, November 28.
¶ ELEANOR W. DAGGETT '98, September 24.
¶ ALBERT R. SHEDD '98, November 5.
¶ WILLIAM W. WEST '99, April 1.*
¶ WILLIAM R. ALLEN, JR., '00, May 11, 1943.
¶ WILLIAM S. PEPPERELL '01, September 10.*
¶ HERBERT M. HATHAWAY '02, November 6.*
¶ BAYARD W. MENDENHALL '02, September 16.*
¶ EVERETT L. UPHAM '02, October 7.*
¶ ASA E. GODDARD '03, December 2.
¶ KENNETH D. JEWETT '03, November 28.
¶ PRESCOTT D. HOARD '04, November 10.
¶ JULES E. WHITE '04, September 23.
¶ ELMER W. WIGGINS '05, October 18.*
¶ EUGENE PHELPS '07, October 24.*
¶ PAUL H. FRETZ '08, November 24, 1943.*
¶ CHESTER B. LAMBIRTH '08, November 5.*
¶ FERDINAND H. PENDLETON '13, June 19.
¶ WILLIAM T. HEDLUND '20, November 29.*
¶ EDWARD V. CARROLL '22, June 21.*
¶ DWIGHT GRAY '22, October 31.*
¶ RALPH E. ESNER '24, April 19.
¶ ROLF S. JULSRUD '24, October 4.
¶ CHARLES S. J. MACNEIL, JR., '33, November 18.
¶ KAEN A. NOONAN '37, February 2.

NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

Society for the Promotion of Engineering Education

The New England section of the Society held its fall meeting at Harvard University on Saturday, October 7, under the auspices of the Graduate School of Engineering. Among those speaking at the morning conferences were the following: Walter G. Whitman '17, Professor of Chemical Engineering at M.I.T., on the subject, "Experimental Training in Labor Relations"; Lewis E. Moore '02, consulting engineer, Albert Haertlein '18, of Harvard University, and John B. Wilbur '26, Professor of Structural Engineering at M.I.T., all on the subject, "Suggested Improvements of the Post-war Undergraduate Civil Engineering Curriculum," with Emil A. Gramstorff '17, of Northeastern University, acting as chairman; John T. Rule '21, Associate Professor of Drawing and Descriptive Geometry at M.I.T., on "Modern Methods of Teaching Descriptive Geometry"; Truman S. Gray '29, Associate Professor of Engineering Electronics at M.I.T., on "Electronic Applications — A New Curriculum in Electrical Engineering," with Alvin H. Howell '38, of Tufts College, serving as chairman; Norbert Wiener, Professor of Mathematics at M.I.T., on "A Non-electrical Account of Communications Engineering"; B. Howard Brown '30, of Dartmouth College, on "What Have We Learned from Teaching the Army and Navy Programs?"; Francis W. Sears '20, Professor of Physics at M.I.T., on "The Physics Curriculum at M.I.T."; Arthur O. Williams, Jr., '34, of Brown University, "Comments on the Engineering Physics Curriculum"; Howard R. Bartlett, Professor of English and History at M.I.T., who led a discussion at the conference on English; and Joseph W. Barker '16, Dean of the Faculty of Engineering at Columbia University, special assistant to the Secretary of the Navy, and a member of the committee on engineering schools of the Engineers' Council for Professional Development, who led a discussion group at the afternoon session. Chester L. Dawes '09, of Harvard University, acted as chairman of the meeting as a whole and also assisted on the committee on conferences and on the local committees. Carlton E. Tucker '18, Professor of Electrical Engineering at M.I.T., was secretary and served on the committee on conferences and on the local committees. Frank W. Garran '24, of the Thayer School of Engineering, was delegate to the national nominating committee and a member of the committee on conferences. Among other members of this committee were Professor Bartlett, Laurence F. Cleveland '35, of Northeastern University, and Professor Dawes. Laurence F. Cleveland also served on the committee on news bulletin; Philip G. Laurson '10, of Yale, on the nominating committee; and Richard H. Frazier '23, Associate Professor of Electrical Engineering at M.I.T., on the resolutions committee; Gordon M. Fair '16, Albert Haertlein '18, and John N. Hobstetter '39 were members of local committees. The annual dinner took place on Saturday evening at the Hotel Continental in Cambridge, with pictures of New Guinea for entertainment.

M.I.T. Women's Association

The first meeting of the season on December 4 was the annual assembly in honor of Ellen H. Richards '73. This year it took the form of a supper party in the Emma Rogers Room to entertain the women students, of whom 22 attended. The new President, Charlotte V. Sage '13, welcomed the group and in behalf of the Association presented its gift of a tea set to the students. Gertrude T. Spitz '17 handed on some enthusiastic reminiscences of Mrs. Richards, explaining the many good reasons in her life, work, and personality for having been so long and kindly remembered by Technology women. The Association highly appreciated hearing the new Dean of Architecture, William Wilson Wurster, give a very modest account of his handling of a war project at Vallejo, Calif., which called for the erection of 3,000 prefabricated houses on one plot of land, to shelter the influx of workers at Mare Island. In illustration he showed a brief colored film, "From the Ground Up."

Among those present were the following: Lois L. Howe '90, IV, Jane H. Bartlett '00, V, with Mrs. H. L. Hazen as guest, Myra L. Davis '03, Dr. Cora B. Gross '09, V, Charlotte Simonds Sage '13, IV, Gertrude T. Spitz '17, VII, Louise Peirce Horwood '19, VII, Marjorie Pierce '22, IV, Florence W. Stiles '22, IV, Katherine H. DeWolf '25, IV, Esther L. Frutkoff '26, VII, Ruth M. Hale '26, XV, Ruth Andrew Dean '29, IV, Grace G. Farrell '29, VII, Mary M. Handrahan '31, VII, Theodora Keith '32, IX-A, Elizabeth M. Dolan '34, IV, Marie Early '39, IX-A, Martha Howe Auerbach '41, IV, Virginia F. Green '41, IV, Alice M. Howe '42, IV, Julia C. Sullivan '42, VII, Mary E. Elder '43, II, Marjorie Stowell '43, V, Mary C. Jones, and Rita M. Reed. — RUTH A. DEAN '29, *Secretary*, 11 Fuller Brook Road, Wellesley 81, Mass.

M.I.T. Association of Buffalo

On November 9, the Buffalo Sons of M.I.T. rose to the occasion and met at the University Club for dinner and the fascinating program provided by Henry B. Kane '24. Thirty-six alumni attended the dinner and meeting, and most of these, anticipating the use of their vocal cords on the new song, proceeded to oil said vocal cords before dinner. The record of the new song was played, and then the boys accompanied it. After this, we sang the song without the record and came to the conclusion that the Buffalo version, with its "barbershop" quality, was the best yet. Mr. Kane's slides and lecture were tremendously enjoyed, and we felt grateful to the Institute for including Buffalo in Mr. Kane's itinerary. We take this opportunity to thank both Mr. Kane and Professor Locke for arranging this meeting. President Tom Speller '29 has plans for a visit to a war plant sometime in January. This meeting should be of great interest to those who desire to see the arsenal of democracy in action. — WALTER H. SHERRY '37, *Secretary*, Ferguson Electric Construction Company, 204 Oak Street, Buffalo 3, N.Y.

Technology Club of Chicago

The Club was host on November 17 to two most welcome and illustrious guests from the Institute, namely Ray Stevens '17, President of the Alumni Association, and Henry B. Kane '24, Director of the Alumni Fund. The dinner meeting was held in the Louis XVI Room at the Hotel Sherman. The assemblage of 60 members was somewhat below par for two reasons: the railroads serving the northern and western suburbs were at a standstill caused by strikes, and we had in competition Mr. General Motors Kettering addressing the national convention of the American Chemical Society. What was lacking in quantity, however, was made up by the quality of the gathering.

After a fine turkey dinner, made more enjoyable by good music and other aids to good cheer, the evening program got under way. The first speaker was our Alumni President, Ray Stevens. He came forth with an instructive discourse bringing us up to date on the state of the Institute, and with the aid of some illustrated slides gave the audience an insight into the reconversion problems there and the plans to solve same in their proper chronological order. Ray's remarks were received with that avid and careful attention that any authoritative information concerning the Institute is accorded. Next on the program was the playing of the record of our new song, introduced at the time of the spring graduation, "Sons of M.I.T." Rad Stevens '17, doing his customary swell job as cheer and song leader, soon had the assemblage rivaling the Glee Club for vocal honors in rendering the chorus.

The main event of the evening came next in the person of Chick Kane, not in his official capacity as director of the Alumni Fund, but as a nationally known nature photographer, illustrator, and author. His talk, entitled "Wild Life," delivered in an inimitable, individualized manner, and illustrated by a series of Kodachrome photographs that have taken over 15 years of painstaking endeavor plus expert knowledge to acquire, defies description to do it justice. Mere words do not suffice. It must be heard and seen to appreciate fully its absorbing interest and wide scope. This talk, first given at an Alumni Council meeting at the Institute, was so favorably received that Mr. Kane was requested to

appear before the local alumni clubs over the country. The Chicago group hereby sends thanks to whoever had the inspiration and unreservedly recommends that anyone having the opportunity to hear Chick's talk on "Wild Life" let nothing interfere.

The evening closed with all hands joining in the Stein Song. Those present were as follows: C. W. Pendell '98, Phil Moore '01, L. W. Adams '03, Leroy Hunter '03, Pete Harvey '05, W. Fred Dolke '08, Louis Jacoby '09, H. S. Pardee '09, George Wallis '09, Don Williamson '10, E. L. Woodward '11, Saul Hoffman '16, Sherry O'Brien '17, Norman Dawson '18, A. F. Sawyer '18, Bob Van Kirk '18, R. F. Cashin '19, E. F. Seifert '19, B. H. Sherman '19, F. W. Boley '20, W. D. Shepard '20, E. G. Farrand '21, J. N. DuVernet '22, Bert Houston '22, Verne V. Cocks '23, Charles Henry '23, F. P. Squibb '23, Homer Davis '24, Gordon Hook '24, C. R. MacBrayne '24, J. B. Spaulding '24, D. H. Keck '25, Louis Sheldon '25, R. J. Chapin '26, Louis Pirola '26, J. A. Herlihy '27, Tom Russell '27, K. H. Otte '28, J. G. Praetz, Jr., '28, Paul Stephenson '28, R. W. Clyne '30, Ed Abbott '31, Wilfred Jones '31, Bryce Spruill '31, D. B. Gilman '32, A. H. Munson '33, J. R. Ferguson, Jr., '37, Greer Ellis '38, Bonner Hoffmann '40, H. E. Dato '41, G. P. Monet '43, H. T. Walsh, guest. — ELMER D. SZANTAY '35, *Secretary*, Sandee Manufacturing Company, 3945 North Western Avenue, Chicago 18, Ill.

Technology Club of Central Ohio

On December 5, the Club held an evening meeting at the University Club of Columbus. The group of 30 included Alumni, their families, and a number of guests from the Audubon Society of Columbus, who were especially interested in hearing H. B. Kane '24, well-known author and nature photographer, talk on wild life. All present agreed that this meeting was the best that the Club has held for some time. Mr. Kane's colored slides covered a wide field of nature study — birds, animals, insects, and reptiles — and were very unusual. His comments, as the slides were thrown on the screen, were so interesting and instructive that he held the close attention of his audience for an hour. About 20 Alumni of the Central Ohio group are away on war duty; but when they return we should like to have a return engagement with Mr. Kane. — CHARLES J. WARD '15, *Secretary*, Bureau of Bridges, Ohio State Highway Department, State Office Building, Columbus, Ohio.

Rocky Mountain Technology Club

The fall meeting of the Club was held on November 3 at the University Club in Denver on the occasion of the visit to Denver of Paul M. Chalmers, Assistant Director of Admissions for the Institute. Because of the uncertainties of present-day travel, Professor Chalmers was unable to attend the dinner, but his arrival later in the evening was assured. In the meantime the program went ahead with talks by R. P. Raynolds '06, of the American Smelting and Refining Company, on the subject of postwar mining, and by Dana A. Kepner '21 on the subject of color photography. Professor Chalmers arrived and proved to be a speaker well worth waiting to hear, his account of the problems facing the Institute now and in the postwar period being most interesting. The meeting was closed with the playing of the latest recording of the new Technology song, "Sons of M.I.T." The officers of the Club for the coming year are as follows: President, Dana E. Kepner '21, Vice-president, Fred. P. Baker '19, and Secretary-Treasurer, Anthony J. Perry '29. Those present at the meeting in addition to the guest speaker were Frank E. Shepard '87, Severance Burrage '92, Charles L. Kinney, Jr., '99, Russell P. Raynolds '06, Charles F. Thompson '14, Edward B. Sebben '16, Dana E. Kepner '21, Alfred E. Perlman '23, William H. Hamilton '26, Melvin E. Meister '29, Anthony J. Perry '29, August T. Rossano, Jr., '38, R. Wayne Parcel '39, Crosby F. Baker '41, and Robert V. Seaman '44-2. — ANTHONY J. PERRY '29, *Secretary*, United States Bureau of Reclamation, Denver 2, Colo.

Indiana Association of the M.I.T.

The regular monthly meeting of the Association was held at the Spencer Hotel on November 8. Fourteen members turned out to hear Joseph M. Cosgrove '22, XIV, discuss "Surface Quality and Designation." The volume of questions and discussion after the formal talk proved the interest and timeliness of this subject. — THOMAS G. HARVEY '28, *Secretary*, Monarch Steel Company, 545 West McCarty Street, Indianapolis 7, Ind.

Southwestern Association of M.I.T.

On November 27 the Association held a dinner meeting at the Hotel President. Twenty-four members and eight wives were present, as well as four members of the Kansas City Camera Club who were invited as guests. F. H. Dierks '12, President, introduced H. B. Kane '24, who gave his lecture entitled "The Wild World." This group of truly remarkable photographs and Mr. Kane's accompanying explanations provided an extremely interesting evening, which will be long remembered by those present. It is to be regretted that more people did not have an opportunity to hear Mr. Kane and to see his slides while he was in Kansas City, since his presentation is one which has universal appeal. After the record, "Sons of M.I.T.," had been played and feebly accompanied by the audience, Mr. Kane told us briefly, during a question period, about recent developments at the Institute, and also about some of the postwar plans. The meeting adjourned shortly after ten o'clock with everyone feeling deeply indebted to Mr. Kane for a most enjoyable evening. — REGINALD W. BULKLEY '27, *Secretary*, 840 Westover Road, Kansas City 2, Mo.

M.I.T. Club of the Province of Quebec

Since the last meeting of the Club in May, when Henri Gaudefroy '34 and S. C. Dunning '17 were designated cochairmen, there has been the further development of the latter being named secretary. Considerable correspondence with the Alumni Office has ensued, by way of checking names and addresses of Alumni in the Quebec district, in order that our meetings may be as representative as possible and notices sent to all. It has been decided that the official designation of our Club shall be as given above.

Prospective membership in or adjacent to the province of Quebec runs to approximately 150 men, of whom about 100 are in or near Montreal.

When these notes were written, notices were being prepared for a luncheon meeting at the Windsor Hotel in Montreal at 12:30 on December 13, when Huet Massue, a student at Technology in 1914–15, now with the Shawinigan Engineering Company, Ltd., was expected to give a talk on his research on Canadian population. — STANLEY C. DUNNING '17, *Secretary*, Canadian Waterpaints Limited, 2100 St. Patrick Street, Montreal 22, Province of Quebec, Canada.

Technology Club of Philadelphia

The first of three dinner meetings of the current year was held at the University Club in Philadelphia on October 17. Chung Yu Wang, who was chairman of the Chinese delegation to the World Engineering Congress in 1929 and author of many books and treatises on geology, spoke on "China — Its Arts and Mineral Resources." Dr. Wang presented a quantity of most interesting data on the historical trend of science and technology in China, emphasizing the tremendous mineral resources awaiting development in his native country. Substantial deposits of antimony, tungsten, tin, mercury, aluminum, copper, iron, coal, and petroleum — to cite a few — are being processed by the harnessing of a minute proportion of the enormous hydroelectric power potential of the Chinese waterways. It was extremely comforting to learn that practically all of the high-grade deposits are located in free China and thus are not accessible to exploitation by the Japanese invaders. It was further gratifying to be told that rival political factions in China are at last united in a common cause. The development of dormant raw materials by Western capital and manufacturing methods will be a major factor in the future of China.

James R. Killian, Jr., '26, Executive Vice-president of the Institute, brought us a most timely and thorough message on "What M.I.T. Can and Should Do in Solution of Postwar Problems." The present abnormal enrollment is composed principally of personnel in the armed services, selected for specialized training, and students of foreign affiliations. The current operating budget of $35,000,000 approximates the Institute endowment and is largely of government origin. The outlook is viewed with optimism, however, since the answers to undergraduate questionnaires specified that more than 90 per cent want to secure their bachelor degrees rather than indulge in specialized training courses. In view of the fact that some 800,000 members of the armed forces wish to continue their education and of the part that psychological readjustment will play in the immediate future, it is planned at the Institute to give more attention to the humani-

ties, as well as to expand in the sciences, including such new fields of education as electronics, acoustics, jet propulsion, and fluid mechanics. Consequently, plans for the extension of dormitory and recreational facilities, for student houses run on a co-operative basis for qualified students requiring financial help, for a director of libraries to incorporate the humanities and social aspects with the technical and scientific treatises, as well as for a theater and music rooms for undergraduate dramatics, should all do much to broaden the scope and foundation of Institute education. Direct professional emphasis will be reserved for the junior and senior years, and the freshman and sophomore classes will be given more general courses. It is believed that the new curriculum will enhance the prestige of the Institute, the virtues and industrial worth of its graduates.

The current officers of the Club, E. J. Healy '23, President, H. W. Anderson '15, Vice-president, G. T. Logan '29, Vice-president, and W. N. Currier '31, Treasurer, endeavored to outline their concept of responsibilities in the bulletin of October 6. The usefulness of the Club, however — its scholarship aspirations and alumni placement planning — can never fully materialize unless guided by the constructive criticism of the collective membership. For it is only by a realization of the great promise of our individual opportunities that we can fulfill our collective moral obligation to the Institute, to industry, and to ourselves. It is hoped that each meeting will be a reunion to formulate the groundwork for the building of a sound and well-organized program. The written support and suggestions of those Alumni unable to attend in person are sincerely solicited.

The second meeting will be held at the Bellevue-Stratford Hotel on January 23, when Eric Hodgins '22, publisher of *Time*, *Fortune*, and *Life*, will be our guest speaker. After Mr. Hodgins' talk, Bill McCallum '24 will show some motion pictures, including "The Battle of China." His past performance has been most entertaining and instructive, and we take this opportunity to express our appreciation. Come yourself and bring as many guests as you like. There will be plenty of room if reservations are made early. We hope to see you all on January 23. — Edwardes S. Petze '28, *Secretary*, Scott Paper Company, Foot of Market Street, Chester, Pa.

The Technology Club of Rochester

Meeting with Chick Kane '24 on November 8, the opening night of his road tour with "The Wild World," the Club enjoyed one of its most successful meetings. Taking advantage of the excellent program Mr. Kane has to offer, it had declared the occasion a ladies' night, and some children also were in the audience. Many things were outstanding among the pictures and "patter" assembled in "The Wild World"; but here in the home of Kodachrome the most noticeable were the excellent color renditions. The approval of the audience was bestowed about equally on the interesting and unusual subject matter and on the artistic appeal of the photography. Comments upon Mr. Kane's work as a naturalist by avocation will be generously scattered through these columns, since he visited most of the local clubs in the eastern area. Each mention may single out particular pictures and experiences, such as the high-speed photographs of Canada geese taking off from a lake, of young wood ducks leaving the nest, or the pictures of small animals and insects. Most typical, perhaps, will be our reaction — that every one of us at the meeting would like to see the same pictures over again at an early opportunity. Fresh from this triumphal meeting, the Club is making plans for its Christmas get-together. This time even the highest of high-speed pictures will find practically none of the undergraduates in Rochester for the holidays, and in common with the other clubs, Rochester is faced with the problem of trying to plan a student luncheon despite the almost certain lack of students.

Members and guests of the Rochester area who attended Mr. Kane's lecture with their wives were as follows: Henry H. Tozier '96, Harold O. Stewart '09, Frank C. Taylor '11, Gerould T. Lane '13, Arthur H. Bond '15, Donald B. Kimball '20, Robert S. Cook '21, Prentiss B. Alger '23, Harold H. Leary '23, Lester C. Twichell '24, Allen L. Cobb '26, Kenneth J. Mackenzie '28, Howard S. Gardner '30, Gregory Smith '30, Richard M. Wilson '30, Arthur S. Hamilton, Jr., '35, Alfred V. Dasburg '36, Paul W. Stevens '37, Collin H. Alexander '39, James S. Bruce '39, and M. Wren Gabel '39. Other Technology men present were the following: J. Cecil Aronson '22, C. King Crofton '22, Robert E. Smith '33, Frederick J. Kolb, Jr., '38, Albert K. Ackoff '39, Harold L. Smith, Jr., '39, Harrie W. Miley '40, and William Staudenmaier '41. — Frederick J. Kolb, Jr., '38, *Secretary*, Building 14, Kodak Park, Rochester 4, N.Y.

M.I.T. Club of Toledo

The Club met at 8:00 P.M. on November 15 at the Woman's Club. An election of officers was held at which C. P. Whittier '27 was chosen president and T. L. Hallenbeck '37, secretary. We had made it a ladies' night, and an audience of some 30 to 40 people assembled to hear H. B. Kane '24, director of the Alumni Fund, give his illustrated lecture on wild life and also to hear from Raymond Stevens '17, President of the Alumni Association. Mr. Stevens brought us up to date on what is now going on in Cambridge, and posted us on some of the plans for the future. Chick Kane's address was enthusiastically received and its conclusion prompted a number of questions from the audience. — Thomas L. Hallenbeck '37, *Secretary*, 4310 Eastway, Toledo, Ohio.

Washington Society of the M.I.T.

The second meeting of the year got under way at 6:30 P.M. in Barker Hall, Y.W.C.A. Building, on November 9, in accordance with the regular schedule — the second Thursday of each month. All Alumni please note the time and place in case you should be in Washington on the lucky day. At every meeting there are new out-of-towners who hear about the gathering.

The quartet ably produced "Look for the Silver Lining" as the opening vocal presentation, after Joe Gaffney '28 had played the piano during the half hour of visiting before the meeting officially opened. Before each dinner Joe and the piano give a musical background, from Tech songs to boogie woogie. In co-operation with the community War Fund drive for funds, the Society granted the head of the fund's speaking committee, S. N. Benson, five minutes, during which he stressed the importance of small things done by the fund for the armed services, particularly in prisoner-of-war camps. Mrs. Stuart Godfrey has appeared in the *Congressional Record* because of her original idea of music for the services. Brigadier General Godfrey is one of the Society's most distinguished members. Mrs. Godfrey has organized an activity which finds, repairs, and sends to music-hungry camps, posts, and ships, music and instruments ranging from ocarinas for a Coast Guard cutter to a phonograph for Nome, Alaska. Proctor Dougherty '97 got all the fellows laughing a couple of times and introduced the "young men" of the Society from the classes before 1900. You will note from the names at the end of this report how many of the young men we had present.

The death of Albert R. Shedd '98 was announced. He has been a Washington resident since 1916, as an engineer in the Bureau of Steam Engineering, the Bureau of Engineering, and finally the Bureau of Ships. Mr. Shedd has supported the Washington Society since his arrival in town and will be much missed.

After dinner Michael Wright, counselor at the British Embassy, was introduced. His long experience with the British Foreign Office qualified him to present an extremely interesting discussion of the way Britain feels about other countries, including ours. His opening remarks were focused on how dependent upon the rest of the world Great Britain has to be because of the large number of people crowded into a group of islands not large enough to grow food for them. This dependent condition makes it necessary that the British foreign policy be right most of the time because a mistake in trade decisions or bungling of relations with foreign powers could quickly and disastrously affect the amount of food the Briton could get to eat. Mr. Wright mentioned the national service policy now being discussed in Britain, which would require one year of national service — not necessarily in the Army — of every youth in the land. Since this concept is similar to some now under discussion in Washington, everyone present was interested in the parallel thinking involved. The leveling influence of the bombing raids and intense civilian activity in wartime will have the effect, in Mr. Wright's opinion, of reducing class distinctions, particularly excessive incomes, after the war. He expects inequities at the bottom to be vastly improved over pre-war conditions. The traditional British free-trade policy was stressed, Mr. Wright stating that the only reason for British Empire preference before the war was a self-defense measure brought on by protective tariffs in other countries. Mr. Wright feels that after the war England will again believe and practice free trade and will employ imperial preference only in self-defense against trade barriers elsewhere in the world.

A question period following the formal talk brought out as many interesting points of view as were previously expressed. Practically every country in the world was touched upon and the influence of British foreign policy indicated by the speaker. One of Mr. Wright's early American experiences illustrated his kinship with Americans. He was visiting at a ranch in New Mexico. One of the ranch hands inquired, "Where are you from?"

"I come from England," he said.

"I *thought* you were from one of the eastern states," was the reply, "I can tell by your accent."

The following attended: 1889: G. W. Stone; 1890: J. G. Crane; 1891: A. J. Hammond; 1892: B. P. Du Bois; 1893: G. W. Stose; 1896: J. W. Clary, W. E. Haseltine; 1897: P. L. Dougherty, F. A. Hunnewell; 1898: Martin Boyle; 1900: H. C. Morris, C. H. Stratton; 1903: W. L. Cook; 1904: H. H. Groves, A. M. Holcombe, F. W. Milliken, G. H. Shaw; 1905: O. C. Merrill, E. T. Steel; 1907: Allen Pope; 1908: P. H. Heimer; 1909: M. R. Scharff; 1911: E. N. Fales, C. P. Kerr, C. G. Richmond; 1915: A. D. Beidelman; 1916: W. H. Blank, F. P. Upton; 1917: J. P. Ferrall, W. C. Mehaffey; 1919: A. H. Blake, L. J. Grayson, E. M. Kenison; 1920: John Nolen, Jr.; 1921: L. W. Conant; 1922: H. H. Fisk, G. R. Hopkins, W. K. MacMahon, C. A. Moore, J. R. Morton, Jr., R. K. Thulman; 1923: H. L. Bond, C. M. Bovis; 1924: J. M. Ashton, J. E. Jackson, W. W. Sturdy; 1925: H. B. Swett; 1926: S. J. Cole; 1927: E. G. Cowen, G. C. Popps, R. M. Tucker; 1928: A. E. Beitzell, J. W. Gaffney, G. D. Mock; 1929: J. A. Plugge; 1930: A. F. Bird, J. R. Bloom, C. W. Maskell, N. C. Nelson; 1932: F. M. Moss, R. S. Prescott; 1936: G. D. Mylchreest; 1937: G. B. Hunter, Jr.; 1938: A. M. Main, Jr., J. W. Steiner; 1942: M. J. McGuire, Z. W. Wilchinsky. — FRANK W. MILLIKEN '04, *Secretary*, 613 North Greenwich Street, Falls Church, Va. ALBERT F. BIRD '30, *Assistant and Review Secretary*, 5070 Temple Hills Road, Southeast, Washington 20, D.C.

Worcester County Alumni Association of M.I.T.

The annual fall meeting was held on November 15 at the Hotel Sheraton in Worcester, where the Association met for dinner. It was well attended considering the difficulties of travel. James R. Killian, Jr., '26, Executive Vice-president of M.I.T., spoke on postwar education, Roscoe H. Goddard, Executive Secretary of the Worcester Chamber of Commerce, spoke on postwar planning as applied to Worcester, and Professor Locke brought greetings from the Institute.

"More than a half million veterans will seek admission to colleges after the war," said Mr. Killian. "Educational institutions are faced with their greatest responsibility and opportunity, both in education and research in the postwar period. Estimates indicate that more than 600,000 returning veterans will seek admission to colleges while extraordinary war developments in science and technology will be awaiting adaptation and refinement for the benefit of industry and the public. The Massachusetts Institute of Technology is planning a temporary increase in its student body during the postwar period in order to accommodate returning veterans. Present studies indicate that the Institute can accept up to a 50 per cent increase for a brief period without lowering academic standards. Questionnaires returned by students in the armed services indicate that they plan on returning for study leading to degrees. To grasp opportunities opened up by war research, the Institute is planning intensive research programs in the fields of electronics, food technology, gas turbines and automatic control devices. Advances in new ways of preparing, processing and preserving foods are typical of war developments having applications important to the public in peace time. The war has demonstrated the value of this concerted research attack on problems, that is, bringing resources of different fields together for the rapid and effective investigation of problems. Educational institutions must find ways of cutting across departmental lines and of gaining more flexibility in the handling of research."

B. John Kiniry '31 is at the Bristol, England, General Hospital and would like to hear from others in that vicinity. — Robert J. Proctor '28 is aboard an aircraft carrier in the Pacific and said to be enjoying his work as a lieutenant in the Naval Reserve. — You no doubt know that our amiable President, Orville Denison '11, is now executive secretary to the Gardner, Mass., Chamber of Commerce and is reported in his glory. — ARTHUR J. LARIVIERE '35, *Secretary*, 7 Woodbine Street, Worcester 3, Mass.

CLASS NOTES

1877

On August 7 the S.S. *Frederick W. Wood* was launched at the Bethlehem-Fairfield Ship Yard in Baltimore, Md. This vessel was the 367th Liberty ship to be launched. She was named in honor of our classmate and was sponsored by his daughter, Dorothy Wood. The launching was preceded by a luncheon at which were present members of Fred's family, executives of the steel company and their wives, and a number of men who were with Fred when he was active at Sparrows Point, and their wives. Fine tributes were paid to Fred at this luncheon. His family presented the ship with a picture of him and a sketch of his life. The Bethlehem Steel Company donated a library for the use of the ship's officers and crew, each book of which was dedicated to Fred in grateful memory of his valuable services to the Company. Thus was one more worthy tribute paid to an outstanding member of our Class.

It is with regret that announcement is made of the death on November 23 of Benjamin C. Mudge. It is hoped that a more extended notice can be given in the future. This leaves nine of us living. — GEORGE W. KITTREDGE, *Secretary*, 592 North Broadway, Yonkers 3, N.Y.

1885

Nine men on our mailing list live in the vicinity of Boston. Six of these and one faithful from Fall River attended our annual luncheon in June — a goodly representation. As our ages vary from 80 to 84, it isn't surprising that so many pass away each year. It is my unpleasant duty to announce the following deaths.

I have just learned that Frederick Bishop Rice, a retired lieutenant commander of the United States Marines, died in Wilmington, N.C., on August 27, 1939. He took a special course at the Institute, beginning in 1881, hence was officially a member of our Class. — Calvin Wentworth McFerran died in Houston, Texas, on March 12. He attended Technology for one year. I wrote to his daughter for details of his life, but received no response. — Albert Pitkin Cone died in Moore Haven, Fla., on April 30. He got his B.S. in Course I. At the time of his retirement he was chief clerk in the office of the chief engineer of the Chicago, Rock Island and Pacific Railway. — Harry Gilbert Frost, who of late years spent his winters in Florida, died at Centre Hillsboro, N.H., on July 6. He was of an artistic temperament and traveled a good deal. He was also a trustee of some family estates. — William Hutchinson Osgood died in Marlboro, Mass., on July 18. He was a retired treasurer of that city and a prominent Mason. — Charles Stanley Robinson died in Coronado, Calif., on August 1. After taking Course III-A, he presumably practised his profession for a while, but, on the death of a brother, moved to California to look after the latter's affairs. While there, he was for 16 years connected with the City Hall in Coronado. A friend writes that he was a cultured "New England gentleman." — I had little personal contact with any of the above and found no evidence among Ike Litchfield's data that he had; hence the information is meager.

Robert Eaton Richardson, born on July 29, 1861, at Pittsburgh, Pa., was moved to Concord, Mass., when an infant. He died at the New York Hospital on October 11. Immediately after graduation he taught at the Western Electric Company in Chicago. He was loyal to the Institute and to the Class and attended such reunions and informal meetings as he could. He was very musical and always genial. He had been in poor health for a year or more, with frequent trips to the hospital for operations or observation. I quote from the November issue of the *Bulletin* of the Edison Electric Institute: He "was graduated from the Massachusetts Institute of Technology in 1885 and took up the then new science of electrical engineering. In Chicago he did pioneer work in electrical construction, and in 1887 with two assistants installed lights in the first Pullman car to be equipped with electricity. This car was arranged for President Grover Cleveland for a trip through the South. Mr. Richardson built the first outdoor lighting system in the country for the World's Fair in Chicago in 1893. From 1900 to 1910 he was General Manager of the Kansas City Electric Light and Power Company. Leaving Kansas City in 1910, he became General Manager of the Consumers Power Company, with headquarters in Kalamazoo, Michigan. In 1915, Mr. Richardson went to New York with the Electric Bond and Share Company, to form a Rate Department which he headed until his retirement in 1933."

In a recent letter Hugh MacRae says: "It is most interesting to know that our Class

graduated the first three electrical engineers in the world." He also says that after being interested in various activities he has come to the conclusion that farming is the great and basic activity in the world, and the most neglected. Only recently he has had the great satisfaction of feeling that the farm program on which he has worked for 50 years has "arrived" and has been reduced to a basis so simple that it can be used with profit, to a greater or lesser extent, by all farmers in the Southern states.

A member of the Class had given us a handsome silk American flag, which we presented in June to the Alumni Association. From Professor Locke, Secretary of the Alumni Association, we received an appreciative acknowledgment in which he stated that the flag will probably be used to decorate the walls of the Alumni Office when the renovation of the latter is completed. — ARTHUR K. HUNT, *Secretary*, Longwood Towers, Brookline 46, Mass.

1888

Charles G. Trefethen was born in Ware, Mass., and entered the Institute with me in 1884. We drilled together in the old drill shed on Exeter Street and have not seen each other since, nearly 60 years. A little while ago I received a letter from him which read as follows: "Your letter addressed to me at Ware has followed me about the country considerably. It was readdressed to me at Coconut Grove, Fla., where I had passed the winter months, but I left there on April 28 for Ware, so back it came and arrived two days after I left for Erie, Pa., on a business trip, and for New York to visit a sick relative. Again it missed me and was overlooked for several weeks, but at last I have it.

"Yes, I remember you at Technology 59 years ago, and where have the years gone? Quite a few times in and about Boston I have run across one of our Class named Stevens and another named Dodd, but those are the only ones I have seen or heard from since school days. For 30 years I was a machine designer in the employ of Brown and Sharpe, Providence, the Norton Company, Worcester, and the Modern Tool Company, Erie, Pa., until a few years ago, when I retired. I have relatives all along the Maine Coast as far up as Bar Harbor. My father was born in Kittery, and for several years I spent vacations with my cousins there. I am 78 but feel much younger and am in perfect health; my family have all passed away — my wife, father, mother, three sisters, and brother. It would be pleasant to meet you again and talk over the events that have occurred since we were schoolboys together in Boston."

Our friendly Secretary of the Class of '87, Nathaniel T. Very, has sent me a letter from Frank M. Ladd '88, who was the heaviest (204 pounds) and still one of the most active men on the team that won the Eastern Inter-Collegiate Football Association championship in '87 over Dartmouth, Amherst, Trinity, and Stevens, not losing a single game, and also defeated Tufts and Boston University. As Very recalls, Ladd was slugged in the Tufts game, and all the spectators saw it. Ladd, however, being as strong as a bull, did not mind it but finished the game in good shape. Those were the grand old football days! — BERTRAND R. T. COLLINS, *Secretary*, 39 Wiggins Street, Princeton, N.J. SANFORD E. THOMPSON, *Assistant Secretary*, 620 Newbury Street, Boston 15, Mass.

1889

The New York *Journal of Commerce* of October 6 has the following dispatch from Lawrence, Mass., about our President, Franklin W. Hobbs: "The great grandson of Abraham Marland of North Andover, one of this country's pioneer wool manufacturers, President Franklin W. Hobbs of the Arlington Mills, will round out 54 years at that big textile unit on January 28 next. He became an employe of Arlington Mills in 1891, its assistant treasurer in 1895, treasurer in 1902 and its president in 1913. He has always taken part in the work of the National Association of Wool Manufacturers. He served as a member of the executive committee from 1910 to 1919 and as a vice president from 1918 to 1926, when he became its president. He continued to hold that office until 1933 when he realized that co-operation with the Government in framing a code under the National Industrial Recovery Act would need the full time of a president. The period 1910 to 1912 found him president of the National Association of Cotton Manufacturers. Thus, Mr. Hobbs is the only manufacturer who has been honored by election to the presidency of the great associations representing the two industries which have been chief factors in the industrial development of this part of the country — cotton and wool. Upon its being chartered by Congress, Mr. Hobbs was appointed one of the three civilian trustees of the Textile Foundation and he has been continually reappointed. Since its establishment he has been chairman of the board. It was the late William Whitman, looking for a young technically trained man to join the Arlington Mills, who sent for Mr. Hobbs while the latter was at . . . Technology. Hobbs' greatest interest is in the vast spread of Arlington Mills' buildings here and he prefers to regard the plant as part of Lawrence, instead of being a concern merely located here. Inasmuch as the Arlington Mills and Franklin W. Hobbs are linked together in textile circles everywhere, it must be said that the gigantic plant has been fortunate in having had practically but two executive officers. The first of these, William Whitman, described as a man of extraordinary vision and the ability to realize his vision, became associated with the Arlington in 1867, serving as executive officer until 1902, and then as president until 1913. From that time until his death in 1928, Mr. Whitman was a member of the board of directors and maintained an active interest in the textile business. The second executive officer, needless to state, is Mr. Hobbs. Serving under him and thoroughly trained in the tradition and precedents of the organization is his son, Marland C. Hobbs, who is the grandson of Mr. Whitman and entered the employ of the Arlington in 1919 on his return from meritorious army service overseas. Starting out in the wool-sorting room, he worked his way to the vice presidency and he is today an important factor in the business." — WALTER H. KILHAM, *Secretary*, 126 Newbury Street, Boston 16, Mass.

1891

The Alumni Office has notified us of the death of Thaddeus S. Welch on February 29. His last address was 1 West 64th Street, New York City. We have seen very little of him over the years and believe he retired several years ago. He attended our 50th and appeared to be in excellent health at that time. His son came to the reunion with him, and they both seemed to enjoy our festivities. Welch was for some time doing engineering work at the Navy Yard in Brooklyn.

According to the Alumni Office, Charlie Ricker is back at his old stand in Havana. We did not hear from him this summer and have had no reply from mail sent to Salamanca, N.Y. — Ed Smith writes that he has no news, but sends his best wishes to the "boys," and regrets that he cannot attend our class dinner.

Francis Holmes writes from Plymouth: "Nothing sensational has happened to me. I had oil, coal, and wood enough to carry me through the winter, and hope for the same this year. I managed to get the same help for the garden this summer and raised enough to keep myself and help out a few friends for current use and canning — this in spite of the drought and bugs aplenty. The hurricane blew off over 100 bushels of my winter apples, but left enough, with what I could also salvage, to last through this winter. My sister and I, who live in adjacent houses, lost some old apple trees and a large sugar maple which stood near the line between us and had been set out by my father about 70 years ago. No damage was done to either house, although more damage was done in Plymouth as a whole than in 1938. I am hoping to attend the next class dinner."

Walter Hopton writes from Syracuse: "I have nothing to report as I have not seen or heard from any of our classmates. I have done very little traveling since the war began, and shall not until, perhaps, when the war is over, if I am still living at that time and in business. My business has been better the last few months. In June, to celebrate my birthday, we went to Plainfield, N.J., to visit Lester Charles '26 and found him well and very busy."

Gorham Dana lunched with Frank Howard at the Massachusetts Federation of Planning Boards recently. Frank is a member of the State Planning Board, and Gorham was recently elected vice-chairman of the Massachusetts Conservation Council. Gorham sent us a newspaper clipping announcing the death of Mrs. Hubert Arrowsmith of Winchester, Mass., Frank Howard's sister, on November 1, and we extend our sympathy to Frank.

Bert Kimball writes from Redondo Beach, Calif.: "Your 'general letter' makes an excellent appendix to the Golden Reunion book. It also brings up memories — some sad ones, of course — yet it was a most happy occasion, our 50th anniversary. Although we live a quiet life here, there are many things to keep us busy these days and there is plenty to think about, too. While in Santa Barbara during the early summer visiting my sister, I called on Charlie Garrison; he was looking very well and leads an active life. He seems to know much about our classmates, and, of course, I enjoyed seeing him again.

"We have recently met Edward H. Raymond '17 and his wife, who are now located at the Biltmore Hotel in the adjoining town of Hermosa Beach. You are acquainted with him, and he was surprised to learn that you were our Class Secretary. He is out here on war construction, and they seem to enjoy this life — a most agreeable couple. Another man knows all about you — Nathan G. Burgster, who has settled down here after retiring from the fire prevention business. He was connected for years with some bureau in Chicago. He and his wife have an attractive home at 619 Avenue C, Redondo Beach. It is on a hillside near us, facing the Palos Verdes Hills. We often get together and have some chats about the men in your line of business. I am glad to have made his acquaintance. I suppose the Class will have a dinner this winter, and I wish I could be present. What are we to do in 1946? I must get back East one of these days, as I want to see my daughter and my grandson, who live in Gilford, N.H. Her husband is in business in Laconia." (Here is where we start work on our 55th: one acceptance already.)

A letter from Robert Ball in England reads in part as follows: "I remember Ensworth very well. One must expect these empty chairs, but yet when they are left so, it is a shock and reminder. Among the youth of our island the war has taken a severe toll. I look with apprehension at the obituary notices in the papers, fearful lest they include some former pupil or relative. The students from here have done, and are doing, noble work, as are those from across the seas. It is heartening to us to feel that your great nation is with us and all out to win, too. Your allusion to roses was especially pleasing to my wife, who loves tending such as we have in our garden. She knows much more about them than I ever did. There is some compensation in the fruit and vegetable department both in the garden and at the table. Tomatoes do well in the frame, but it is not easy to ripen a full crop in the open. My family are all in Kenya, British East Africa. My son, who gave his life in the war in 1940, left a widow and little son. She has married again and has a son by her second husband. My daughter, who is married to a civil engineer in Kenya, has a son, so if you will allow a fraction for my daughter-in-law's second, you might chalk me up for two and a half grandsons, granddaughters none. I am a long way behind you in this respect, and you have the additional advantage of having them within reach. I hope we shall soon be corresponding in a world at peace."

Hartley White writes from Braintree on November 10, and sends some pictures of his new winter home at Mount Dora, Fla., saying: "I was county engineer of Norfolk County (where I started the department) from January, 1925, to January, 1940, when under Massachusetts law, I was obliged to retire. To wean myself from the job I loved, I took my first real vacation and went to Florida. I vowed I would buy nothing down there, but I came back in April, 1940, owning three acres of land on the north side of Lake Gertrude at Mount Dora, Fla., two acres of which are tangerine groves. I now have a cottage there where we spend our winters. I always have plenty to do, although I practically gave up business here in my old office in 1943. My son carried it on until he died in 1937. Now I have turned it over to a young man, Schuyler Clapp, of Sharon, Mass. I am to be retained as consultant for at least two years, until he gets well established. The address for a year will be 971 Washington Street, South Braintree, Mass. We hope to have a new building in Braintree proper by that time. My Florida address is Box 64, Mount Dora. That section of the state is much like Cape Cod except that there are lakes in every direction — 1,400 in Lake County, of which Mount Dora is a part. We have been living all summer at our 20-acre camp in Pembroke with the intention of starting south before winter sets in."

George Atkinson writes from Summit, N.J.: "I am sorry to see that so many of my friends have passed on, all the A's, B's, and C's and Punchard, who went to high school with me. As for myself, I am well, enjoying three meals and a two-mile walk every fine day. I am a member of the Old Guard, a gathering of retired men who meet every Tuesday. Out of a membership of more than 100, 40 or so show up, and we have interesting talks, motion pictures, travel talks, and so forth. My wife and I went to Maine this summer and had a nice time at the old place."

Lewis Dunham writes from the Engineers Club in New York, with comments on our recent general letter, and adds: "The thought has no doubt occurred to you that some endowment for the Class might be worked out to endure for a certain time. Our Class was no doubt one of the last of those having a great proportion of descendants of early Americans or New Englanders, having more probably than any graduated since 1891. Do you not think this influence might be kept alive in these days of attempted domination of our country by European or other foreign groups? Such an influence might have possibilities for constructive good!" (Dunham's suggestion will be presented at our class dinner in December.)

Steve Bowen said he was going to Winter Park, Fla., as usual this winter, about the middle of December. We put the date of our class dinner earlier than usual so that Steve could come. At this writing we have not heard from Ambrose Walker, who goes to Winter Park every winter for a long stay. He has a home there not far from Hartley White at Mount Dora.— A recent letter from Charlie Hanington in Denver reads in part as follows: "I have been out of the city but once this past summer, and then in the museum car, through Estes Park, across the range to Grand Lake on the Pacific slope of the Great Divide, and home over Berthoud Pass, some 200 miles. The museum attendance is still good — around 75,000 this month."

Frank Howard sends us a note in his usual jovial mood, reminding us that age is not a matter of years, but of the heart and mind: "I am still at the same old place and doing the same old things, but I must admit that I don't move quite so far nor quite so fast as I did once. I took a five-weeks' trip last summer through Yellowstone and Glacier parks and Waterton Lakes, and brought back some pictures to remind me of a fine trip and a lot of inspiring scenery. That "great" great-grandson is doing well at two and a half years. I have just accepted a reappointment to the Massachusetts State Planning Board with the stipulation that they might have to send an ambulance and wheel chair to get me in to the meetings toward the end of my six-year term. . . . I shall certainly hope to be at that dinner you promised." — HENRY A. FISKE, *Secretary*, Grinnell Company, Inc., 260 West Exchange Street, Providence, R.I.

1893

The following excerpts from the resolutions presented at the October meeting of the Alumni Council on behalf of Fred Fay supplement the obituary which appeared in the columns of "The Institute Gazette" in the July issue of The Review. ". . . Frederic Fay graduated from the Massachusetts Institute of Technology with the degree of Bachelor of Science in '93 and Master of Science in '94; his was the first Master's degree conferred on a Course I graduate. . . . He always retained much interest in the activities of the Massachusetts Institute of Technology, serving at one period as president of its Alumni Association and later as Alumni Member of its Corporation. For 35 years he was a member of the Alumni Council. The Class of 1893, of which he was a member, participated ardently for many years in Technology affairs, for which Mr. Fay, as Secretary of the Class from its graduation, was largely responsible. The class history, which he prepared on the occasion of the class reunion in 1923, was a notable example of class history. Mr. Fay's death occurred exactly one year after the Class had celebrated its 50th anniversary. . . . He was the author of numerous papers and articles appearing in the publications of the American Society of Civil Engineers, the Boston Society of Civil Engineers, and the Technology Review, and of many addresses presented to various technical societies dealing with engineering, transportation, and city-planning matters. During much of his life he gave considerable time to the work of the American Unitarian Association, and served as vice-president of the Unitarian Laymen's League and chairman of the Board of Trustees of the First Parish Church in Dorchester. . . . Fred Fay was an indomitable worker, a thorough and logical thinker; he possessed rare judgment and generous public spirit. He gave generously of his time and thought to the welfare of the younger engineers who came to him for counsel. *Be it resolved:* That in the death of Frederic H. Fay the Alumni Association of the Massachusetts Institute of Technology has lost an honored and respected member whose sterling character and superior ability were appreciated by all. *Be it further resolved:* That these resolutions be spread upon the records of the Association and that a copy be transmitted to his family."

Passages in letters from professional acquaintances, received at the time of Fay's death and incorporated in memoirs presented by the American Institute of Consulting Engineers, serve well to express the feelings of those who knew him: "His was a useful and constructive life"; "his friendly and sympathetic, as well as businesslike and fair attitude"; "always most thoughtful and courteous"; "a great engineer and a fine gentleman"; "His many

years of active service will constitute a lasting contribution to the prestige of the engineering profession"; "a great loss at a time when men of real experience and vision are most needed"; "The engineering profession, too, has lost one of its good men"; "I treasure memories of the imperturbable Fay on the witness stand, confounding his questioners by the depth of his knowledge and understanding"; "We have come to regard him with highest esteem"; "Notable among those engineers who may be said to have built their own monuments, he lived a life which accomplished permanent benefits for his fellow men"; "His broad grasp, his trained technical approach, and his steady search for the right answer to all the problems left me always with a very high regard for his ability and general attitude towards the public interest"; ". . . a remarkably active and useful engineering career over a long period of years. Many important structures testify to his skill and integrity." Other memoirs prepared by the American Society of Civil Engineers and the American Concrete Institute will be found in the publications of those societies.

The following notice dated Easton, Md., October 2, appeared in the New York *Times:* "James Ramsey Speer, retired manufacturer and inventor, died . . . at Wilderness, his country home near here, at the age of 74. Mr. Speer, who came to Talbot County in 1911 from Pittsburgh, where he was associated with the steel industry for many years, was a director of the Easton National Bank and president of the Easton Publishing Company. He became associated with the old Shoenberger Steel Company after his graduation from Massachusetts Institute of Technology in 1893 and was promoted to the position of general manager in 1898. Mr. Speer invented several chemical alloys, including adamite, a high carbon nickel-chrome steel and molybdenum nickel-chrome steel alloy. He was an officer for the Alien Property Custodian in the first World War, was a leader in civic affairs in Talbot County. He leaves a widow, Mrs. Helene S. Speer; a daughter, Mrs. Frank E. Waddles of Buffalo, N.Y., and a son, J. Ramsey Speer Jr. of Easton."

Other deaths which have come to our attention are those of William H. Graves on September 19, 1943, Howard A. Gilson on January 13, 1944, Lawrence Wells Case on February 16, and Samuel Edgar Whitaker on August 10. — FREDERIC H. KEYES, *Secretary*, Room 7–211, M.I.T., Cambridge 39, Mass. GEORGE B. GLIDDEN, *Assistant Secretary*, 551 Tremont Street, Boston 16, Mass.

1895

Gerard H. Matthes, as director of the Waterways Experiment Station, at Vicksburg, Miss., has performed and contributed many experiments for helping the Allies win the war. Waterway technicians worked 24 hours a day for months, in a lonely concrete building near the Mississippi River, to eliminate the "bugs" from the United Nations' plan to use artificial harbors in the invasion of France. So urgent and so hush-hush were the findings, says Gerard, that their reports, transmitted immediately to Washington, were never put in writing. The technicians, headed by Captain J. B. Tiffany, Jr., of the Engineers, began tank tests of artificial harbor models immediately after the first Quebec conference of President Roosevelt and Prime Minister Winston Churchill in August, 1943, and concluded their work last December. The final findings, he said, were transmitted to England by plane.

The Memphis *Commercial Appeal*, of last August 6 has presented a picture of how "Old Man River Is Helping Win the War," and part of this will be of interest to our classmates: "Within less than a week after our soldiers waded ashore in Northern France to begin the greatest offensive in the history of wars, the Allied High Command announced that air bases had been established in the liberated territory and that the air umbrella was being raised from them. Most of us took this accomplishment as a matter of fact sort of thing and passed it off as that. Engineers, airmen and perhaps some few others knew, though, that there was more to it than happenstance. These few knew that somewhere there was something that made it possible, because they knew that air bases to support the modern flying ship aren't just conjured out of the ground. A handful of young scientists down at Vicksburg, Miss., knew what the answer was, for that answer had been furnished the Air Forces by them after months and months of patient, painstaking work. These men had done this job as thoroughly as they have done others during the 15 years' existence of the United States Waterways Experiment Station, of which they are a part. Early in the war, our strategists foresaw the day when we would need airports and need them quickly. Time would be of the essence and certainly there would be no time for large-scale grading and drainage operations. Need for the airports wouldn't allow for those time-consuming operations. What, then, could the answer be? Someone devised the flexible landing mat, which could be placed quickly with a minimum of manpower and which would provide an efficient base. The innovation of the landing mat, however, did not provide the end solution of the problem; there were numerous obstacles to be overcome before their use could be practical and successful. To answer these riddles was the job the Army gave the Waterways Experiment Station and how well they have answered it is being told now on the battlefields of France and the atolls of the Pacific. Their experiments, conducted in Vicksburg and just across the Mississippi River in Louisiana, have led toward establishing a standardized mat, with particular emphasis on perfecting a type which would be easy to ship, easy to lay and which would, at the same time, give maximum service. The investigations, however, have gone even farther than that. They have attempted to tell the combat Engineers just what sort of performance they could expect from a landing mat placed on a particular kind of foundation. It was a big order and it isn't filled yet — day in and day out, the experiments continue in an effort to find even better means and methods.

"The Waterways Experiment Station is an agency of the Corps of Engineers, United States Army. It has operated with a minimum of fanfare. Engineers the world over know it well. The folk who live in the flood sections know something about it; but the people generally know little, if anything, about the station's existence and its reasons for being. While it has been of inestimable value as a war agency, the station was set up primarily for delving into knotty problems relating to navigable rivers, which in time embraced flood control problems, and continues to maintain its identity as such. The experience gained in the almost limitless perplexities which river and flood control planning entails, has been of untold value in solving the problems which the war has placed on the station for solution. Director of the station with the title of Head Engineer is Gerard H. Matthes, Technology '95, a kindly, white-haired man who presides over the laboratory's affairs from a small office on the second floor of the Station's Administration Building. His 49 years as an engineer had made him a storehouse of information, yet his experience had not dulled his delight in something new and something different. Most of Mr. Matthes' subordinates are young men who have practically grown up at the station. Their average age is around 35, but many of them have been at work there since soon after the station's inception. In peacetime a guide service was established and thousands of visitors were shown the Station. During the war no visitors are allowed to enter the Station. After the war it will again be opened to the public."

Edward P. Schoentgen, at the age of 71, passed away on October 17 from pneumonia, while in a hospital in his home town of Council Bluffs, Iowa. His early education was received at a Milwaukee Academy. He attended a boy's manual training school at Washington University, St. Louis, Mo. Finally, he came to Technology for his degree in architecture. He also studied in Paris, France, and Florence, Italy, and spent some time in Belgium, the birthplace of his father. With this educational background and with a born instinct for the artistic and beautiful, he sought the career of an architect. His plans were laid to establish a firm in St. Louis, Mo., with a Technology man as partner, but fate led him to devote the greater part of his time to the grocery business interests started by his father. At his death he was president of the Groneweg and Schoentgen Company, chairman of the board of directors of the Council Bluffs Savings Bank, and president of the Pottawattamie County Chapter of the Red Cross, which he served for 23 years.

For 24 years Schoentgen served as a member of the state board of education, and in 1936 the fine arts building at the University of Iowa was dedicated to him. While he was known to many in his home town as a successful grocer, he was otherwise known as a great humanitarian. His broad connection with civic welfare gave him the opportunity to develop an intimate touch with all classes and strata of life. This was a passionate interest and resulted in daily contact with all classes for the purpose of providing the best of home, health, and better living conditions. In his personal business he saw the relation of the best to the most beautiful, and through the drabber side of things commercial shone the spirit of one, who, somehow, could relate art to everyday life. He was interested in the issues of the

market place and the halls of learning, and in the problems of the poor; he brought to all the deliberations of a mature intellect and an innate passion for thoroughness. He is survived by his widow, Mabel, one daughter, one son, Major J. P. Schoentgen, two sisters, and four grandchildren — all of Council Bluffs, Iowa.

Ira A. Nay, for many years living in Auburn, Maine, is now living with his son at 84 North Spring Garden Avenue, Nutley, N.J. He is planning to see "the boys" at the 50th reunion next June. We learn that William Fletcher Patten, VI, passed away on November 1, at his home in Hingham, Mass. Patten followed the telephone business as an equipment engineer, planning and installing many types of switchboards, and acted as consulting engineer for the licensee companies. Equipment was installed by him in Wisconsin, Illinois, Ohio, and Michigan, and surveys were made for installations in the principal cities of the country. During World War I, he assisted in obtaining and planning telephone switchboards for national camps and war industries. — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass.

1896

The '96 New York dinner date is set for February 20.

The Washington crowd had another get-together at the Army and Navy Club on December 6, details of which will be given in the next issue. Myron Fuller writes that he is destined to be at Rockport, Texas, for another winter, but apparently he is enjoying that section of the country, except that travel is much restricted because of gasoline limitation. At the time he wrote on November 10 the weather was fine and clear with the thermometer around 70 or 80 degrees. None of the six predicted fall hurricanes had hit them.

From Paul Johnson '98 has come a nice note saying that when he read in The Review that Steve Crane was retired and living in Pasadena he made a call on Steve at 140 South Los Robles Avenue and was fortunate enough to find Steve and Mrs. Crane both at home. She was busy hanging draperies. It seems he had never met Steve before, but was delighted to find him in good health and enjoying life in Pasadena. The Cranes had driven west in their car, but had had tire trouble and had finally sold the car in Albuquerque, continuing their journey by rail; consequently, without a car in California, they were not getting around very much.

John A. McIlvaine came north for the summer, which he spent at 31 West Allen Lane, Mount Airy, Philadelphia, Pa. The last word from Walter Stearns was that he was still in Schenectady in November and his plans for the winter were not definitely settled. The probability was that he and Mrs. Stearns would remain in Schenectady until after Christmas, unless the weather turned very cold, and would spend January in North Carolina, February and March in Florida, April again in North Carolina, and be back in Schenectady the first of May.

Classmates will be shocked to learn that Dave Beaman passed away on October 31 in New Bedford, where he had been living a life of retirement, although still very active in civic and other affairs. It seems that Dave's health had not been of the best for a month or more and he went to the hospital for an operation, which took place on October 27. Dave's life work after graduation was with the New Bedford Gas and Edison Light Company, where he started as an electrician and worked up through various offices to become general manager and president, and after his retirement in 1940 chairman of the board of directors. Dave had been director of the Boys' Club and Young Men's Christian Association for a number of years, and was treasurer of the Y.M.C.A. He was an executive committee member of the New Bedford chapter of the American Red Cross, a rotarian, a governing board member of the Board of Commerce industrial development division, active in the Community Fund organization, and president of the New Bedford Automobile Club. Beside his widow Dave left his son, David W. Beaman, Jr., '38, and two granddaughters. Dave was widely known and highly respected in New Bedford and elsewhere and will be greatly missed by his host of friends.

The sympathy of the Class goes to Arthur Baldwin for the loss of his wife, who died in the hospital at Charlottesville, Va., on November 8, after a short illness. Her heart had not been in the best of condition for a number of years, but when she and Arthur last visited Schenectady, Walter Stearns thought that she seemed to be in better health than she had been for some time.

Let me wind up with another of Bob Flood's contributions: "This is about a Technology man, but it starts with Will Rogers meeting President Coolidge. You know how glum Mr. Coolidge was, never cracked a smile, and always answered in one syllable. I never saw him but twice, and then he was as glum as one of those wooden Indians you used to see in front of tobacco shops. Well, it seemed Will Rogers was to meet the President and it got noised around among his friends, and one of his friends said, 'I'll bet you can't make him smile in 20 minutes.' 'I'll bet I make him laugh in 20 seconds,' replied Rogers. Of course, Mr. Coolidge didn't know anything about the bet. Well, Will Rogers was introduced something like this: 'Mr. President, I want to introduce Mr. Will Rogers.' Will Rogers stuck out his hand and acted sort of confused, as he said, 'Excuse me, but I didn't quite get the name.' And Mr. Coolidge broke right out and laughed. Say, Mr. Coolidge could laugh just like anyone else. Now we had a man at Tech by the name of Coolidge, and he made you think of President Coolidge. Folks came from down East somewhere I'm told. Well, anyhow, our man Coolidge was initiated into the same fraternity I was and at the same time, so I didn't see the fun. But they told me Coolidge was sent to a drugstore after closing time to buy a two-cent stamp. Now it seems the drug clerk had had that trick played on him before, and when Coolidge asked for the two-cent stamp, he made a dive for him. But Coolidge wasn't exactly in the exact spot where he had been when he first began to ask for that stamp, and the fellow missed him by about four inches, but he chased him. Chased him for two blocks, but he didn't catch him. The fellows were amazed at Coolidge's speed and tried to get him in athletics, but nothing came of it. Now I'm just wondering if Win Coolidge was in any way related to President Coolidge. He didn't choose to run either." — CHARLES E LOCKE, *Secretary*, Room 8–109, M.I.T., Cambridge 39, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge 38, Mass.

1897

Again the only class news that your Secretary has to offer is that of the passing of two of our classmates. If the fellows will not send in any items of themselves or of others, such items cannot be manufactured out of coal, air, and water after the manner of the marvelous chemical products of today.

John Trott Alden, II, died at Newton Hospital, Newton, Mass., on September 28. Mr. Alden was a direct descendant of John and Priscilla Alden of Plymouth, Mass. He retired several years ago, but previous to his retirement he was connected with the Massachusetts Investors Trust of Boston. He was a life member of the Appalachian Club and was chairman of the board of trustees of Channing Unitarian Church of Newton. He leaves a wife, one daughter, and one son.

Bernard Barrows, X, died suddenly in Richmond, Va., on October 20. His early work after graduation was as assistant examiner in the United States Patent Office in Washington, D.C. After being graduated from law school in Washington, he joined the staff of the United Shoe Machinery Company in Boston as a patent lawyer and served them for a period of years. Later, he again entered the Patent Office in Washington and held an important position as division chief at the time of his death. Burial was at Reading, Mass. — JOHN A. COLLINS, JR., *Secretary*, 20 Quincy Street, Lawrence, Mass.

1899

About a year and a half ago I had occasion to write to Arthur I. Kendall for some professional information. Art, because of illness, did not graduate until 1900, but as he was with our Class most of the time, he is fair game for this column. I found he had retired in 1942 as research professor of bacteriology at the medical school of Northwestern University in Chicago. He is now living in Oracle, Ariz., some 28 miles northeast of Tucson. Oracle is situated at an altitude of about 4,500 feet above sea level. The quarterly *Bulletin* of the Northwestern University Medical School, Volume 16, Fall Quarter, contains an interesting biographical sketch and a bibliography of nearly three pages. From some reprints Art sent me, I gather that in his spare time he is continuing to write scientific papers.

William Eaton West, V, died on April 1 in Toronto, Canada. West attended Hyde Park High School near Boston and Phillips Academy at Andover, Mass. He was active on the track team and was a member of Phi Beta Epsilon fraternity. West's first position was with the American Radiation Company in their Boston office. He was later transferred to their Pittsburgh office. In 1910 he joined the staff of the Steel Radiation Company in Montreal, Canada, which position he held until 1917. In that year he joined the staff of Page-Hersey

Tubes, Ltd., Toronto, Canada, in the capacity of sales representative. Later he became district sales manager, and this position he held until his death. William West was a member of the Massachusetts Sons of the American Revolution, of the Scarborough Golf and Country Club, the Canadian Gas Association, and the United Church. He was a former president of the Canadian Water Works Association. Mr. West was twice married. His first wife was Mabel Higgins Fowler, who died in 1930. Surviving are his widow, Nellie H. Wark West, a son, Charles M. Fowler, of Toronto, and a daughter, Mrs. Wesley Fowler Hamilton, of Carson City, Nev.

On my annual lecture trip to Columbia University Medical School in New York City, I ran into Earle B. Phelps. He retired several years ago from the faculty of that institution but has been called back into active service. We had time for an interesting chat, and he has promised to send me some of the highlights of his career. — BURT R. RICKARDS, *Secretary*, 381 State Street, Albany, N.Y. ARTHUR H. BROWN, *Assistant Secretary*, 53 State Street, Boston 9, Mass.

1900

The committee appointed at our reunion in 1940 has started to work on a 1945 reunion, and expressions of opinion are requested from all members of the Class. They will be helpful in determining the time and place of this year's get-together. The date of Alumni Day has been tentatively set on Saturday, June 23, and graduation on Monday, June 25. Transportation figures in the picture this time, but conditions may be different by June. When writing in with your ideas, be sure to add a line or two about yourself for use in this column; news has been very meager of late.

Dan Johnson '00 reports from Tonopah, Nev., where he has been located for many years, that mining is now shut down there, but he hopes for a revival after the war. He put in some six months on the building of the Sierra Ordnance Depot, about 65 miles northwest of Reno in California, and then did some more work for the same contractors in Alameda, Calif. After that he worked for the Metals Reserve Corporation north of Tonopah, and was concerned with other things in Tonopah, such as a housing project, Tonopah water supply for the air base, and the Manhattan Dredge. These things have kept him working, but not steadily. — C. BURTON COTTING, *Secretary*, 111 Devonshire Street, Boston 9, Mass.

1901

A recent newspaper clipping states that Charles K. Flint, Vice-president of the Eastman Kodak Company, has been elected a director of the Lincoln-Alliance Bank and Trust Company of Rochester, N.Y., and goes on to say: "Flint graduated from the Massachusetts Institute of Technology in 1901 and joined the Westinghouse, Church, Kerr Company of New York City. He became assistant engineer at the Kodak Park works of the Eastman Kodak Company in 1911. He occupied various positions in the company until 1920 when he became assistant manager and in 1936 general manager of the Kodak Park works. In 1941 he was elected a vice president of the company. Flint is a director of the Rochester Institute of Technology and a director of the Convalescent Hospital for Children."

Grace MacLeod, V, retired on June 30 with the title of Professor Emeritus of Nutrition, Teachers College, Columbia University. She writes: "For the sake of having the records complete, you will want to know that Greta Gray and I should both have M.A. and Ph.D. noted after the S.B. I took both degrees in chemistry at Columbia; Miss Gray obtained the M.A. in nutrition at Columbia, the Ph.D. in public health at Yale." — Joe Evans has been moving about considerably in the last two or three years, and now we have received notice that his address is 202 South 37th Street, Omaha 3, Neb. I have no details available, but I remember that about four years ago he was in charge of building dams, and such, in Nebraska and adjoining states for the United States Government; so that I suspect that he may be doing something similar this time.

I report with regret the death of William S. Pepperell, III, in Greensboro, N.C., on September 10. The following news dispatch from Greensboro, N.C., on September 11 summarizes his career: "William S. Pepperell, 64, well known among textile manufacturers in North Carolina as director of Purchases, Research and Engineering for Carter Fabrics Corp., here, died at his home after an illness of six weeks. He had suffered with a heart ailment for approximately four years. As director of purchasing for Carter Fabrics Corp., Mr. Pepperell was connected with the Cleveland Cloth Mills, Shelby, N.C., S. Slater & Sons, Slater, S.C. and Stanley Mills, Stanley, N.C. as well as the Carter Mill at Greensboro, and the one at South Boston, Va. A son of the late William S. and Ella Louise Pepperell, he was born in Nashua, N.H., on Feb. 21, 1879. Mr. Pepperell was educated in the schools of Nashua and of Boston, and was in the class of 1901 at Massachusetts Institute of Technology. Mr. Pepperell lived in New England until about eight years ago when he came to Greensboro. His early experience was with the Draper Corp. of Hopedale, Mass., where he was a sales engineer.

"It seemed as though Mr. Pepperell had held almost every textile association position of honor that New England could give him. He had been assistant treasurer of the Grosvenor Dale Co., and treasurer of the Warren Mfg. Co., which position he had resigned on Dec. 31, 1930, after being with them for nine years. Mr. Pepperell had been president and also secretary-treasurer of the Southern New England Textile Club; president of the Cotton Waste Association; a director of the Cotton Waste Association; a director of the Cotton-Textile Institute; a president of the Rhode Island Textile Association; had been on the Board of Government of the National Association of Cotton Mfrs., and also had been its treasurer. Mr. Pepperell had been vice-president of the Grosvenor-Dale Sales Corp. (N.Y.). Other previous affiliations had included being president of the Hebron Warehouse & Processing Co. and executive director of the NRA Code Authority for the Textile Machinery Manufacturing Industry. When Mr. Pepperell first came to Greensboro it was as head of the purchasing department of the Burlington Mills Corp. He had been a member of the Purchasing Agents Association of North Carolina and Virginia, and also of the National Association of Purchasing Agents. His clubs have been, over a period of years: Rhode Island Country Club, Greensboro Country Club, Merchants Club of New York, Technology Club of New York, Masonic bodies, Colebrook Country Club of New Hampshire. Mr. Pepperell was married in 1908. He was a 32d degree Mason, and a member of St. Andrews Episcopal Church. He leaves his widow, the former Mrs. Gertrude Somerville, and three sons, George S. Pepperell, Providence, R.I.; David Pepperell, Barrington, R.I., who is with the Lorraine Mfg. Co., and Charles L. Pepperell, Kingston, N.Y." Mr. Pepperell was buried in Rhode Island.

Having been informed that Bob Derby had completed a trip last summer to Australia and return for the United States Lend-Lease Administration, I wrote to him to see whether he would write a brief account of it for us. He answered as follows: "I am sending you a transcript of my talk at a luncheon of the Export Managers Club in New York on September 26; perhaps you can lift what you want from that. This talk, however, took 30 minutes to deliver, and it will be difficult to condense it without destroying any interest it may have. I have therefore written up something which is a lot less than my address. Take it or leave it, or chop it up as you please." So here it goes, unchopped: "I will give you a brief summary of my recent career if you feel that anyone would be interested. After three years in five government jobs which were practically all war work, the last of them being in the Office of Foreign Relief and Rehabilitation Operations of the State Department — I joined the United States Lend-Lease Administration in July, 1943. I flew to Australia in August and remained seven months as technical consultant to the Lend-Lease Mission there. On the way out I had luncheon one day with Admiral Nimitz in Hawaii and attended a dinner of the Technology Club of Hawaii. The headquarters of our Mission were in Sydney, but I made mine in Melbourne, as the Australian Ministry of Munitions was there with its technical branches. Our job was to screen the Australian requisitions for Lend-Lease equipment and to certify that they were for important use in the war effort and that they could not be secured locally. In following up these requisitions, often to the source, I visited 225 manufacturing and other plants between Adelaide and Brisbane, the industrial section of the country. In all I traveled something like 12,000 miles in Australia, mostly by air. During my stay we card-catalogued some 5,000 Lend-Lease machines, giving their location, the purpose for which ordered, and the work on which they were being used. We segregated under Lend-Lease control several million dollars' worth of machine tools which were sent out for projects later depressed or discontinued. We diverted several hundred machines to important installations of the United States Army and Navy for maintenance and repair projects where certain equipment was vitally and promptly needed.

"Sydney is a bustling city. I might compare it with Seattle. It has a wonderful

harbor and is justly proud of its magnificent bridge. The city has several good night clubs, and seems very much alive. Melbourne is quite different, perhaps more like Boston. It has a quiet dignity and as much tradition as any young country could have — broad streets, fine trees, a symphony orchestra, and a remarkable botanical garden, but no night clubs worthy of the name. The Royal Melbourne Golf Club has two 18-hole courses. At Melbourne I had luncheon one day at the country place of Sir Norman Brookes, I think the only tennis player ever knighted. The Melbourne Club still does not allow pipe smoking in the dining room. I was fortunate during my stay to get four days in Tasmania and two weeks in New Zealand. Tasmania is a sportsman's paradise. In the lake country they have caught 30-pound brown trout and 17-pound rainbow trout. I took back on the plane to Melbourne a 5-pound rainbow trout and a 7-pound brown trout. Tasmania is in some ways not unlike Vancouver Island. New Zealand has a population of only a million and a half against Australia's seven million. It is almost entirely an agricultural country. I visited the glaciers in the South Island — wonderful scenery — and motored in the North Island from Wellington, the capital, to Auckland, stopping overnight at a fishing camp where we had wild boar for dinner and rainbow trout for breakfast. During that trip I had a chance to see the Maori country and the people. Flying from Australia to New Zealand takes eight hours. Look at the map. After the war the world will have a lot to offer the traveler. After seven months my job was done. Australia had most of the machine tools and other mechanical equipment which she needed. The saturation point had been reached. I flew back in May in about 46 flying hours, not counting the four stops. I came through in slightly less than four days. The trip was not too uncomfortable." — Guy C. Peterson, *Secretary*, 788 Riverside Drive, New York 32, N.Y. Theodore H. Taft, *Assistant Secretary*, Room 3-266, M.I.T., Cambridge 39, Mass.

1902

In the death of Bayard Mendenhall, which occurred September 16, as given in the November notes, both the Class and the Institute lost a most loyal supporter. Distance made it impossible for him to attend more than one or two class reunions, but he was always loyal in his support of the Class, and at the time of his death was serving the Institute as Honorary Alumni Secretary for his district. Mendenhall lived in Salt Lake City practically all his life and took an active part in its community activities. In 1917 he started in business for himself, founding the Mendenhall Auto Parts Company. He carried it on successfully through the years and was president at the time of his death. He was also serving as a director of the National Automotive Parts Association. He had been active in the Salt Lake City Community Chest for 10 years prior to his death and was its president in 1941. Politically minded, he had served one two-year term in the state legislature, being elected on the Democratic ticket in 1932. In November, 1941, he was appointed state director of the Office of Contract Distribution, a federal agency which was set up in connection with the granting of war contracts, and served until July, 1942. He died of coronary thrombosis, at the age of 65. He is survived by his wife, Luella Spence Mendenhall, by two sons, Bayard W., Jr., and Spence Mendenhall, and by a daughter, Mrs. Bruce Montgomery, and two grandchildren. His youngest son, Norman, died in 1933 of injuries received in a motorcycle accident.

Since the last class notes were published, the Class has lost two more members by the deaths of Everett L. Upham on October 7 and Herbert M. Hathaway on November 6.

Upham had been in the wool business in Boston since graduation, starting with the wool commission firm of Brown and Adams, where he worked up to general management of the fleece wool department and had general supervision and management of the grading, blending, and selling of wool grown in the fleece wool section (the territory east of the Mississippi River and north of Kentucky) handling about ten million pounds per year. He continued in the wool business up to the time of his death, in later years a member of the firm of Breed and Upham, Inc., and then owner of the firm of E. L. Upham and Company. He is survived by his wife, his son, Everett L. Upham, Jr., and his daughter, Constance, Mrs. Norman Dean.

Hathaway was for many years associated with Starrett and Van Vleck, architects, 267 Fifth Avenue, New York, having been with them since 1914 to the time of his death. He had previously been with Gilbert and Betell, architects in Newark, N.J., where he started in the field of school architecture, in which he later specialized. In his home city of Montclair, N.J., he had designed 15 elementary and high schools and several administration buildings. In New York he executed plans for the Horace Mann School for Boys, Dodge Hall at Columbia, and Lincoln School, Teachers College, Columbia University, and also for schools in many other cities and towns. In 1938 he served as chairman of a special five-member architectural commission, appointed by the New York Board of Education to study and report upon the New York City schools, and in Montclair he served as a member of the Town Planning Board from 1933 to 1939. He is survived by his wife, Mrs. Mary Hershey Hathaway, and by three daughters, Mrs. Robert J. Watson, Mrs. Ernest H. Oliver, Jr., and Mrs. Robert E. Crockett.

The address of Charles McCarthy, formerly Washington, D.C., is now 227 North Fourth Street, Las Vegas, Nev.

The engagement of Ruth A. Rowe, of Tryon, N.C., and Chicago, to the Secretary's younger son, Richard Balcombe, was announced in October. Miss Rowe is now working for a Master's degree at the University of Chicago, from which she was graduated in June. Her fiancé was studying at Chicago when the war broke out but is now with the Merchant Marine Service, seeing the world as first officer on a Liberty ship. — Burton G. Philbrick, *Secretary*, 246 Stuart Street, Boston 16, Mass.

1903

Another retirement to be noted this month is that of Frank C. Reed, who has been president since 1936 of the Westinghouse Electric Elevator Company, a subsidiary of the Westinghouse Electric and Manufacturing Company, and a vice-president of the parent company since 1942. In January 1943 we noted in this column Reed's promotions and activities with Westinghouse and now wish him many more pleasant years as he leaves these duties. We wish that all the men in the Class who have retired would take upon themselves the job of digging up and sending in to us news items about other members of the Class. Your Secretaries haven't the ability to write columns of literature like those Allen Winter Rowe '01 used to write, nor the source of information that Charlie Locke '96 has. We need your help if you expect to see the Class represented every other month. — Frederick A. Eustis, *Secretary*, 131 State Street, Boston 9, Mass. James A. Cushman, *Assistant Secretary*, 441 Stuart Street, Boston 16, Mass.

1905

The November Review carried quite a story of Elmer W. Wiggins, V, particularly in regard to his work in training Army aviators. Before the issue was printed, we received word that Wig had passed away in a Columbia, Mo., hospital on October 18. The Providence *Bulletin* of October 19 carried the following story, which supplements and adds finis to previous notes on a grand classmate and gentleman: "Elmer W. Wiggins, 66, commercial air service operator, with prewar bases at Hillsgrove and other points in New England, died . . . at the Boone County Hospital, Columbia, Mo., after a week's illness following a heart attack. Mr. Wiggins was taken ill on a train while en route to Columbia Municipal Airport, where he had an operating base, and was taken to the hospital upon arrival there. Treasurer and general manager of E. W. Wiggins Airways, Inc. since 1931, Mr. Wiggins had since 1942 participated in the building and operation of a primary army training school at Camden, Ark., by the Wiggins-Marden Aero Corporation. Upon completion of the concern's contract with the army recently he returned to his Rhode Island home at 87 Columbia Avenue, Edgewood. Mr. Wiggins first became interested in commercial aviation in 1929, when he found it advantageous to be able to travel by personal plane in the territory served by E. W. Wiggins & Co., distributors of cellulose products, which he had organized the year before. He made his first solo flight in 1931, when he was 53 years old and later that year passed the government test for his private flying license. He not only flew widely himself, but taught all members of his family to fly. While on an air trip to Miami, Fla., in 1936, he was stricken with a heart attack near Raleigh, N.C. Since that time he had flown only in company of a licensed pilot, but continued to make many trips by air.

"Mr. Wiggins was born in Warsaw, N.Y., Nov. 16, 1878, a son of the late John Wesley and Margaret (Silence) Wiggins. Raised on a farm, he began earning his own living at the age of nine. He attended Warsaw High School and worked his way through Amherst College, where he was graduated in 1901. He taught chemistry and physics and coached athletics for a year at a preparatory school at Syracuse,

N.Y., and then enrolled at the Massachusetts Institute of Technology, where he was graduated in 1905 with the degree of Bachelor of Science in chemical engineering. He was a chemist with the A. D. Little Company for two years and then entered the employ of the E. I. du Pont de Nemours & Co., as chemical engineer, acid and powder line superintendent and manager of powder plants. He was assistant manager of the Hopewell Guncotton Plant during World War I and manager of a plant at Arlington, N.J., for three years. He was in the insurance business for two years and then became sales manager of the Viscoloid Company, a du Pont subsidiary, and later was New England representative of the Nixon Nitration Works until he formed his own company.

"After formation of E. W. Wiggins Airways, Inc., in 1931, he established a base at the State Airport at Hillsgrove, later adding bases at Norwood, Mass., Newport, New Bedford, Boston, Sebago Lake, Me., and summer bases in Maine and New Hampshire. His concern operated both land and seaplanes and had 125 planes in operation at the outbreak of the war, when all were grounded. He later resumed flight operations at Concord, N.H., and Columbia, Mo., outside the coastal area, and his organization assisted in the training of pilots for the army and navy. Mr. Wiggins was prominent in the affairs of the National Aeronautic Association, at one time serving as Rhode Island governor of the organization. During NRA days, he was a member of the national code authority for the aviation industry. He was a member of the American Institute of Chemical Engineers, Phi Delta Theta, the Amherst and Chemist Clubs of New York and the Warwick Country Club.

"Mr. Wiggins married Ida M. Marcy of Superior, Wis., in 1908. There were five children. After a divorce at Cambridge, Mass., in 1927, Mr. Wiggins married Margaret A. Stone of Kansas City, Mo., in 1929. They were divorced in 1936 and later that year Mr. Wiggins married Liane F. Houston of North Providence, who survives. Also surviving are his children, Mrs. Alta Mary Stumpf of Milwaukee, Mrs. Kathleen Senn of New Jersey, Mrs. Ruth Faude of Cleveland, Miss Virginia Wiggins of Honolulu and Lt. (jg) Elmer W. Wiggins, Jr., instructor at the Naval Air Base at Glen View, Ill., a brother, Ralph Wiggins of Tulsa, Okla., and a sister Carrie of New Jersey."

Members of Course III particularly and the rest of us in general will be interested in the reply we received from Professor Richards in response to a letter your Secretary wrote congratulating him on his 100th birthday (August 26). His reply was, "Cracky to the boys of the Class of 1905." We have another representative on the Alumni Council, Edward A. Barrier, III, who has been appointed a representative for the Technology Club of Chicago. Leon G. Morrill reports a son who is a lieutenant in the Army and two grandchildren. Harry Wentworth, VIII, writes that he has not seen either of his two boys overseas for nearly two years; the older, after being deputy chief of Commandos for nine months in one of the European areas, is now deputy chief of intelligence for one of the European armies. The other is United States property auditor embracing everything owned by the Army (for the south Atlantic theater). Harry is grandpa to four, some of whom, he says, know him better than their own father. Ralph Hadley, I, announces a grandson born in May, 1943.

Fred A. Pirie, II, writes that he and Mrs. Pirie are back where they started as both boys are married and away. The older is with the Seabees at Pearl Harbor, and the other with the Sylvania Electric Products in their New York office. Carroll C. Curtis comes to light after long retirement in the office of the paymaster of the New England Shipbuilding Corporation at South Portland, Me. Carroll reports one son, who has been for some time with the Marines as warrant officer, just returned from Africa. The other son, under engineering exemption, is with the Texaco Company. Carroll has three grandchildren.

Sam Shapira keeps finishing up these big government assignments, then seeks new fields to conquer. First it was Camp Devens, then Cushing General Hospital, Framingham, Mass.; now he's back in the district office of the United States Engineers in the Park Square Building in Boston. Sam's son, Norman (M.I.T. '41), after serving a year at Edgewood Arsenal, Md., and a year in Brazil, is now a major in the Chemical Warfare Service in Italy. Grafton Perkins, V, reports as follows: "Grafton, Jr., is executive officer of a warship. The Navy is so hush-hush about him (as well as 3,000,000 others) that we can only guess what he is doing, but we suspect it to be some kind of assault craft since he was in the Marshall and Mariana actions, probably also Leyte. Robert W. is a lieutenant in the Air Forces — a photo interpreter. He has recently sailed from somewhere to somewhere, claiming he is on an expedition to capture penguins for training as pilots of buzz bombs. My son-in-law, Jim Carlisle, is also a lieutenant in the Navy, having been transferred from sea duty to a law job in Washington. The grandchild score now stands at 4, with no great-grandchildren. I wonder who will produce the first of these?" While so many are bragging about Navy lieutenants, your Secretary modestly reports that his daughter, Marjorie, a lieutenant, junior grade, in the Navy Nurse Corps, has recently returned from eight months of duty in a United States Naval Hospital near Southampton, England. According to her letters, there was "absolutely no danger," but this and her stories of near-contacts with buzz bombs do not coincide. She is at a naval training station at Bainbridge, Md.

Mrs. George B. Jones acknowledges a letter your Secretary wrote trying to convey the sympathy of the Class in her bereavement. Their oldest son, Bayard, had taken over his father's patent law business, and a son, George Bayard, 2d, had recently arrived. — Fred W. Goldthwait, *Secretary*, 274 Franklin Street, Boston 10, Mass. Sidney T. Strickland, *Assistant Secretary*, 71 Newbury Street, Boston 16, Mass.

1907

Eugene Phelps died on October 24 as the result of an automobile accident, details of which I do not know. Gene was graduated in Course III and during 1907 and 1908 took postgraduate work in Course I. During the next year he traveled abroad, then worked for the Miami Copper Company for a year, and in 1910 took over the Phelps Ranch in Pitchfork, Wyo., where he remained until his death, developing it into a very large and prosperous project. He is survived by his wife, Helen Davis Phelps, and two daughters, both over 20 years old, all of whom live on the Z/T Ranch, Pitchfork, Wyo.

According to a clipping thoughtfully sent to me by John Frank on November 13, Clarence Howe is now minister of reconstruction as well as minister of munitions and supply for Canada. He was chairman of a delegation at the international civil aviation conference held at the Stevens Hotel in Chicago. — Bryant Nichols, *Secretary*, 23 Leland Road, Whitinsville, Mass. Harold S. Wonson, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1908

The first meeting and dinner of the season were held at the University Club in Boston on November 14. The following were present: Linc Soule, Stiles Kedy, Sam Hatch, Bill Medlicott, Toot Ellis, Linc Mayo, George Freethy, Bill Booth, Joe Wattles, Myron Davis, Harold Gurney, Lang Coffin, and Nick Carter. Frank Towle, George Belcher, Cohen, Henry Sewell, Harry Lord, Fred Cole, Doc Leslie, Arthur Gardner, Winch Heath, and Cookie, who usually show up, sent regrets, as they were out of town or had previous engagements. We hope to see them at the next meeting on January 9. After a fine dinner, news from various classmates was talked over. Linc Soule reported a granddaughter born September 10 and Joe Wattles told us he had become a grandfather again, to a granddaughter born on November 1. Bill Medlicott told us he had recently heard from his son, who is with General Patton's division. Linc Mayo reported on the class finances and told us that the Class is solvent with a bank balance. I had hoped Cookie could be present to report on the Alumni Fund, which I believe is going fairly well. If any of you haven't sent in your subscription as yet, please do. Harold Gurney showed some fine Kodachromes taken during an extended trip to the Canadian Northwest last summer, and Joe Wattles showed Kodachromes taken on fishing trips in Maine at Yorks Camps, Jackman, and Keazer Lake, as well as views in Florida taken last winter.

Hardy Cross was recently awarded the 17th Lamme Medal by the Society for the Promotion of Engineering Education, specifically "for his development of revolutionary methods of analysis in structural engineering; for his application of these methods to the rigorous training of civil engineers; for his insistence on the great responsibilities of the individual teacher and his scorn of the superficial in education. . . ." Hugo Kuehne has been advanced to fellowship in the American Institute of Architects, "in recognition of his broad civic interests and his long public service . . . his unassuming devotion to the profession of architecture . . . his establishment of the department of architecture at the University of Texas, and for his subsequent aid and encouragement to architectural education." V. M. Frey, who settled in York, Pa., after graduation, re-

ports that through the years he has been engaged largely in the manufacture of burnt lime, crushed stone, fluxing stone, and so forth. He has also had considerable to do with the sale and proper use of dynamite and explosives.

We are sorry to report the death in San Francisco of Commander Paul H. Fretz on November 24, 1943, and of Chester B. Lambirth at Pleasant Ridge, Ohio, on November 5. — The following changes of address have come in: Viggo E. Bird, Aluminum Company of Canada, Ltd., Sun Life Building, Montreal, Province of Quebec; Louise M. Bosworth, Smoky Hollow Lodge, Washington, Conn.; Charles A. Gibbons, Jr., 2818 Robin Hood Avenue, Houston 5, Texas; Major Lynn A. Loomis, Mira Montes, La Jolla, Calif. — The second get-together meeting and dinner of the season will be held at the University Club, Trinity Place, Boston, on January 9, at 6:00 P.M. The usual notices will be mailed early in January. Please make your plans now to come. — H. LESTON CARTER, *Secretary*, 60 Batterymarch, Boston 10, Mass.

1909

From Paul: "I have a nephew of whom I could not be more fond if he were my son. He is named for one of his uncles — Paul Wiswall Fairbrother. Since his initials are P.W.F., we call him Puff. Now, Puff volunteered about two years ago. He is 27, a long, lean, lank string bean with a disarming smile. A few weeks ago he won a sergeant's rating. He's a technician on a bomber. His outfit went overseas last March; it was in England for several months and is now stationed near Paris. This is what he wrote me on September 27: 'Paris is more beautiful than any city I've seen yet. New York, of course, has more to offer and is more dynamic, but even so, Paris left us all goggle-eyed, broke and happy, maybe slap-happy. What a reception they gave us! They thought we were their liberators and went all-out to show us a good time. Everyone smiled, waved, and "bon-joured" us at the drop of the hat. For a while it was hard to get by a sidewalk café without someone's offering us a drink. I met some swell people that way; in fact on the first day we went to town. A judge advocate, his son and daughter, and some friends nabbed us and took us on a sightseeing promenade of Paris. The people are so glad to be free again that they all get out as much as possible. The next day in Paris I met Pierre Andriotte, his cute wife, and a girl. The three of them did a good job of occupying most of my time from then on. All three could speak very good English. Pierre and his wife had been to America four times, and Jacqueline, a luscious, tall, dark, redhaired number, learned English in school. Anyway, Unc, I had dinner at Pierre's three times, twice at Jacqueline's, and once with her in a sidewalk café eating Army K rations with wine as a chaser.'

"K rations at a sidewalk café in liberated Paris! Now I know Paris a bit, myself, and it is a comfort to hear that the spirit of Paris is still very much in evidence. But picture Puff opening up his Army K rations in Paris, the gastronomic capital of the world! At the Franklin Baker unit of General Foods on the Hoboken waterfront, where I was before going over to the New York office, they are making great quantities of these K rations; and I vow this is the first time in history that Paris has resorted to Hoboken for the makings of a meal that was enjoyed to the full by all."

Rudolph Riefkohl, II, who came from Puerto Rico but prepared for Technology at Concord High School, is now a colonel in the General Staff Corps, with headquarters at the Third Service Command, Baltimore. But let him tell us of his activities: "I have little of an exciting or interesting nature to convey to my classmates. The war, unfortunately, caught me in an age bracket which excluded me from consideration for duty in any of the active fields. Consequently, I have been fighting the war in a swivel chair in the Baltimore, Md., sector. In August, 1940, having returned from foreign duty at Puerto Rico and Panama, I took over the assignment of Corps Area quartermaster covering the areas consisting of the states of Virginia, Maryland, and Pennsylvania. Immediately upon the outbreak of the war I was assigned to duty as director of supply, which involved directing the Chemical Warfare Service, Engineers, Signal Corps, Medical, Ordnance, and Quartermaster activities in the areas which underwent the change of name to the 'Third Service Command.' During this period my work was extremely arduous in connection with the expansion of the Army, the activation of large camps, and the distribution of supplies to the military in the areas. During this last August my directorship of the Supply and Services activities was terminated, and I was assigned to duty as assistant to the Chief of Staff, Third Service Command, which job I still hold. It has all been very interesting and continues to be so, however unexciting."

Chet Pope, X, played right tackle on the football team, held several class offices, and has always been active in class affairs. At the 30th reunion at the Oyster Harbors Club he entertained us with colored motion pictures which included both the World's Fair at Chicago and the Fair at San Francisco. At the present time he is a successful businessman, golfer, and farmer, as may be inferred from the following: "A description of my activities in recent years will be dull reading compared with the experiences of other members of our Class, or other Technology classes, who have been more actively engaged in war activities; but these have been exciting years for most of us. I may well start off with a résumé of my life since leaving the Institute. Up to 1918 I was a chemist for the Forbes Lithograph Manufacturing Company in Chelsea, Mass., an excellent apprenticeship which led to my being able to obtain very satisfactory positions with large printing ink manufacturers, such as Ault and Wiborg Corporation and Philip Ruxton, Inc. Inside politics and jealousies in these large concerns led me to believe that the best future for me would lie in the use of my general knowledge of printing and lithographic inks for my own personal advancement. In 1927, the firm of Pope and Gray was incorporated, with Dwight Gray '22 as my partner. After a year or two of competitive business we decided that the manufacture of specialties, along with our regular line of printing inks, would give us a greater spread. We introduced to lithographers and printers certain types of protective surface coatings that could be run on printing or lithographic presses, allowing this class of work to be done by them in their own plants without their being obliged to send the work out to special finishers. We specialize in the manufacture of metallic coatings, as well as metallic inks, for use on printing and lithographic presses. We were able to bring the manufacture of these products to a certain degree of perfection resulting in a considerable demand, not only in this country but abroad.

"Sales promotion and servicing gave me opportunities to travel extensively for several years up to 1941 — pleasant not only as travel but for the contacts with customers, and for the subjects thus provided Mrs. Pope and me on which to exercise our hobby of photography. On many of these trips photography was our main consideration and business only a side issue. We have a collection of movies as well as stills of England and Holland that probably will never be duplicated. We have also a collection of colored movies, colored stills, and regular line photographs of the Latin-American countries. Since 1941, however, I have been much more confined to my business. Requirements made it difficult for us to obtain raw materials. In order to remain in business it was constantly necessary for us to make substitutions and see that they worked satisfactorily. We have surmounted all these difficulties, have maintained our customers, and everything would be gratifying if it were not for taxes and labor troubles.

"Outside of business and golf, my interests have centered in the conduct of a 10-acre farm near Quakertown, Pa. We started out in a modest way with one cow, one pig, a few chickens, and a few acres of land for cultivation. In a few years we wound up with five cows, a thousand chickens, several pigs, and about 45 acres under cultivation. This last summer we could get no help and were finally forced to sell the farm in Quakertown and our home in Maplewood, N.J., and concentrate in one location at New Vernon, near Morristown, N.J., where we now have about 19 acres. Here we can keep a cow and a few chickens and are having better luck with help. Marcia has always been the farm manager, without much support from me in the line of farm work. But we could have made it pay, with a good living for all of us, if there had not been so much trouble getting the right kind of help. We were getting good prices for eggs, chickens, and butter for which the demand is good these days. We now have a home within commuting distance of New York where we can have home life as well as farming enough to provide at least fresh milk, cream, butter, and eggs. My son, Philip, is in the Marines. Fergus, who is 15 years old, is at Hill School; and we have two daughters — Diana, who is eight years old, and Amanda, five. Pauline, my daughter by a previous marriage, is now a biologist at the Cornell Medical Center. My class associations in past years have been more or less tied up in my friendship with Paul Wiswall, who has always been an inspiration to me, because of his interest not only in my personal family affairs but in the growth of my business. Let me extend my greetings to classmates who have known me in the past, hoping they will

call on me when in New York City or near Morristown, N.J."

In the class notes of The Review for November it was related that Brad Dewey had been awarded the Chemical Industry Medal in recognition of his work in colloid chemistry and in administering the synthetic rubber program. The award was made at the Hotel Roosevelt, New York, on November 10. Among those who spoke on Brad and his accomplishments were Dr. Karl Compton and Dr. Vannevar Bush '16. Charles Almy '10, Vice-president of the Dewey and Almy Chemical Company, was to speak on the personal side of Brad, but since he was away on an important mission to England, his address was read by an associate, John A. Lunn '17. In accepting the medal, Brad spoke on "The Role of Organized Research and Business in American National Defense." He stressed the fact that it was big business that wrought the miracle of research and production that has enabled the United Nations to achieve supremacy in technological warfare and made a plea for free enterprise which, because it had been guilty of some mistakes, had unjustly been made the whipping boy by politicians in their bent for power. — PAUL M. WISWALL, *Secretary*, 90 Hillside Avenue, Glen Ridge, N.J. CHESTER L. DAWES, *Review Secretary*, Pierce Hall, Harvard University, Cambridge 38, Mass. *Assistant Secretaries:* MAURICE R. SCHARFF, Apartment E227, 3860 Rodman Street, Northwest, Washington 16, D.C.; GEORGE E. WALLIS, 1606 Hinman Avenue, Evanston, Ill.

1910

During the past month I received the following letter from Gordon Holbrook, and the first paragraph is one to cheer the heart of any class secretary. Perhaps it may influence other members of the Class to help out in having better notes in The Review.

"Recently, Mr. Fassett of The Review spent the day with me, and we discussed the fact that the notes for The Review from our Class were often conspicuous by their absence. He laid it squarely back in my lap by inquiring how often in the past 34 years I had written you, and my face immediately turned a rosy hue. There is no use bewailing past omissions, so here goes for a belated report. After graduation from Course XIII, I spent two winters in the shelter of the Institute as assistant and in the spring of 1912 launched into active shipbuilding at the Bath Iron Works. During the last war, I helped build destroyers at Fore River and in 1920 came to Federal at Kearny. Here my southward trek has stopped, except for brief visits to other shipyards, and here it appears that my active shipbuilding career will end. I have been successively hull superintendent, general superintendent, and works manager. I now divide my time between our two plants, three miles apart, trying to supervise the activities of over 40,000 employees and accustom myself to seeing women working in shipyards. Our experience in setting a record of $500,000,000 worth of business in 1942 and 1943 is something to tell the grandchildren about later, in front of the grate fire. I married in 1913 and have two children. The son, M.I.T. '39, II, is test engineer on airplane superchargers for Turbo Engineering in Trenton, and the daughter, after attending Swarthmore, married A. W. Gabriel, Jr., '39, XIII. The latter couple have three children of the usual grade reported by grandparents. Postwar plans are hazy, but the writer hopes not to get too far from the smell of salt water, the flash of welding arcs, or the sound of riveting guns. Here's hoping for a bang-up 35th reunion in June, 1945. Mrs. Holbrook often speaks of your kindness, and that of your wife, at the Toy Town Tavern on the 30th reunion."

I met Al Huckins early in November, and he had just seen Cliff Hield, who was in Boston for his son's graduation from the Institute. Walt Spalding, who is a lieutenant commander in the Navy, is now in charge of maintenance and construction of the Hingham Depot at Hingham, Mass. I often see C. W. Wallour, who is a close neighbor of mine. His two boys are in the armed services. John Barnard, who usually spends half of his time down on the Cape and the other half in Boston, now finds that because of his architectural ability he must spend most of his time on the Cape assisting in repair of damage done during the September hurricane. — HERBERT S. CLEVERDON, *Secretary*, 117 Grant Avenue, Newton Center 59, Mass.

1911

All hail to our latest benedict — Charlie McManus, I! Yes, sirs, in a frank admission at our "Seven Come Eleven" class dinner at Walker Memorial on the eve of the seventh day of the eleventh month, another of our supposedly confirmed bachelors confessed that he went to Sugar Hill, N.H., on vacation this summer, hoping to catch a glimpse of Bette Davis, but instead met Miss Elinor Laberne Mulready, of Wollaston, also vacationing at the popular Granite State beauty spot. You've guessed it — on August 15 they were married in St. Ann's Church, Wollaston. The matron of honor was Mrs. Ruth O'Leary and the best man, Thomas C. McManus of Kingston, N.Y., a brother of Charlie's and a captain in the Quartermaster Corps. P.S. They returned to Sugar Hill for their honeymoon.

Dennie and Jack sure were fortunate in their choice of a date this year — you remember the custom lapsed for one year, when the United States Army was making full use of Walker Memorial — for we had within one man of two elevens present, with 21 classmates around the festive board. Included in this number were several newcomers, who added greatly to the interest of the talkaround. Before the postprandial man-by-man reports, we paused in silent tribute to our erstwhile first marshal, Ted Parker, I, who had passed away since our last meeting. This had been suggested by Don Stevens, Class President, on a card to Jack expressing regret at being unable to attend because of "an Army-Navy celebration on this day, making a clean sweep for our three plants (Okonite)."

Seven of the members present were either first-timers or "long time no see" entrants. Walter Allen, XIII, reported that, as construction and development engineer for the A. C. Lawrence Leather Company, Peabody, Mass., he was really on a selling job — selling ideas and then selling someone the idea of carrying them out. He and his wife, a former schoolmate of Dennie's at Framingham High, Marion Congdon, have a married daughter, two granddaughters and one son, a lieutenant in the Army Engineers, now in England and hankering to cross the Channel.

Johnnie Bigelow, IV, kept us in stitches with his characteristically effervescent and subtle innuendo (or something) by telling us how he is practically everything but mayor of his native Marlboro, Mass. *Zum beispiel* (shades of Blackie!), he is city treasurer, tax collector, city engineer, chairman of the Republican City Committee, treasurer of the Chamber of Commerce, secretary of the Rotary Club and official surveyor for Marlboro and five surrounding towns. He and his wife have a married daughter, two granddaughters, and one grandson.

John Bowman, XI, is now with the highway department of the state Department of Public Works, thus being associated with the above-mentioned newlywed, Charlie McManus. John is a bridge designer and has been doing some special work for the Navy at Quonset Point, R.I. One of his daughters is now married and has a baby daughter. She was graduated from Brown University in 1942 and shortly before graduation appeared on one of Fred Allen's radio programs in New York City. John and his wife have another married daughter, who likewise has a baby girl. In conclusion, John said frankly: "I'm voting for FDR tomorrow!" The winah!

Making his first contact with the Class since he transferred from Technology to Yale in the middle of our freshman year, Ambrose D. Gring, X, told us the interesting story of his career. He had a hankering for medicine and after his four years at Yale went to Harvard Medical, but for financial reasons was not able to continue. Always musically inclined, he began teaching music and does ghost writing for lecturers. At present he is managing an apartment house at 1378 Beacon Street, Brookline, and teaching and writing as well.

Another we had not seen for some time was M. J. Lowenberg, VI, who next month completes his first 25 years, as he expressed it, with Stone and Webster. He said his work for the past few years had been and continues to be extraordinarily interesting, specializing as he does in construction and design. He said he only wished he could give us some of the unbelievable figures on construction, expressing extreme optimism about construction in the postwar era. He is married and has no children.

L. O. Mills, VI, also made his first visit to a class function, it being his good fortune to be in Boston for a day or two on a clothing dealers' convention. He followed his father into the retail clothing business in Holyoke, where he is manager of the System Company, one of Holyoke's leading men's stores. He, also, is married and has no children.

Don't ever let 'em short sell you on the value of a 1-cent postal card. On November 2, I received my usual monthly grist of address changes for the Class and saw: Louis L. Wetmore, IV, 145 Cypress Street, Newton Center 59. Immediately I sent him a postal suggesting he come to the dinner. He came. For years he has been practising architecture in Glens Falls, N.Y., having formerly been with the noted architect, Bosworth, in the design of the original

Technology buildings in Cambridge. He became associated with a Boston architectural firm in October. He and his wife have a son, 32, who was graduated in Course IV in 1936, a married daughter, 26, and a son, 18, who is interested in music.

The stories of the regulars, as you might call them, were particularly interesting to the seven newcomers, but economy of space prohibits repetition of them here, as they have appeared in other class notes. The list includes the following men: John Alter, IV, now working for his "former best client," John W. Bolton and Sons, Inc., in Lawrence, as a research and development engineer and keeping his hand in by doing some evening teaching at the Boston Architectural Center; Ernest Batty, II, construction and maintenance engineer for the Lincoln Stores, Inc., Quincy, and his erstwhile business partner, Obie Clark, II, who described some very ingenious new developments he had made in his own business, the Nelson Cement Stone Company, Braintree; Marshall Comstock, VI, now an old-timer with Wagner Electric Corporation; Dennie Denison, VI, now particularly happy in his new berth as secretary-manager of the Gardner (Mass.) Chamber of Commerce; Tom Haines, II, and Jack Herlihy, II, each a veteran of 31 years' service with Boston Edison, with Roger Loud, VI, also a veteran with the same concern; Stan Hartshorn, X, since graduation in business with his father in C. H. Hartshorn, Inc., Gardner, Mass., manufacturers of baby carriages and furniture — oh, by the way, Stan claimed particular credit for his wife, Julia, and himself in having a daughter in the service, Barbara Hartshorn, a lieutenant, junior grade, in the Navy on active duty with the Waves, as well as a son, Stanford, Jr., now a freshman at Technology; Morris Omansky, V, rubber chemist for many years with Arthur D. Little, Inc., Cambridge, whose daughter Frieda, a student at the Institute in her last year of the five-year course in Architecture, joined Daddie after the party, and a number of us had a chance to renew the acquaintance made at our 30-year reunion at Plymouth in June, 1941; Walter Phillips, VI, for years with New England Telephone and Telegraph Company; O. W. Stewart, I, head of the inspection department of Factory Mutuals (his service there totals 33 years), servicing some 12,000 plants throughout the country; and Emmons Whitcomb, X, very happy in the multitudinous phases of the work he is doing now on the business staff of the Institute, under D. L. Rhind, bursar. Sara Denison and Julia Hartshorn, who had driven down from Gardner with their husbands, in Stan's Buick, also were on hand to greet 1911 men as the dinner ended.

As a tag to the dinner story we really should give the second generation data not included in the preceding paragraph. Comstock: two married daughters, one living with her husband in Springfield, the other with her husband, who sings in a United Service Organizations unit in the south Pacific, and a son, now in the V-12 course at Tufts. Dennie: one married daughter, now living with her two-year-old son in Worcester, while her husband is in Army aviation in Harlingen, Texas; one son, a lieutenant in the Naval Reserve, now in Morocco, the other son an aviation machinist's mate in the Navy on duty in the Pacific area. Haines: two daughters, one married and living with her husband in Arlington, Va., her husband being a lieutenant, junior grade, attached to the office of the Secretary of the Navy in Washington, and a younger daughter, at home, engaged to a flying Marine on duty in the Marshall Islands. Herlihy: a son now in England, engineering officer on a Flying Fortress; a younger son, wounded on D-Day and recently hospitalized back home in Cleveland, Ohio, and a daughter, who is a secretary in one of the research labs at the Institute. Loud: a son, who was graduated from Technology in '42, and now is back there, doing research and teaching in the mathematics department, and a younger son, Weymouth High School '43, now with the Army in France, after a course at Purdue University and training in Texas. Phillips: two boys in the Navy, the older an ensign in the European area and the younger a lieutenant commander in the Dental Corps, serving in the Pacific area, and a third son still in school. Stewart: four boys, respectively, an Army captain (M.I.T. '39) on active duty along the Burma Road; a lieutenant, junior grade, in the Naval Reserve (Amherst '40, with postgraduate work at M.I.T.) also in the south Pacific area; a staff sergeant in Field Artillery in Europe; and a naval aviation cadet, in training at Memphis, Tenn. Whitcomb: one son, a naval aviation cadet at Corpus Christi, Texas. Truly a fine record.

Some very interesting notes came in, as requested, on the reply cards of several classmates who, for one reason or another, were unable to attend. For instance, Alf deForest, XIII, said he had to be in New Hampshire for election day, "the most important election day in many years," adding that he had "no change to report, although getting older and less lively, but attaining enough seniority rating to disguise the growing incompetence." Here's another one for the "hats off" department — hats off to the Dad of the youngest 1911 baby — Bog Stevens, formerly Suren Bogdasarian, IV! He and his wife have another son, David, born on June 29. Bog was sorry that a business appointment kept him from the dinner; he's with Stone and Webster, you know. Via his good wife, Ina, we had greetings from Roy MacPherson, II, who was hospitalized at the time of the dinner. "We hope to get him home in another week," Ina added. Another message from a 1911 wife revealed that Harold Lord, II, "has been in the Pacific area since last January, stationed at Brisbane, Australia, as a major with a Service of Supply engineering section, until transferred in September to Perth, Australia, as United States representative." John Alter, by the way, said that he had heard Bill Foster, IV, was still in India on Red Cross work.

Cal Eldred, VI, reported: "My son, Cal (Dartmouth '37), enlisted in the Naval Reserve last summer and was commissioned a lieutenant, junior grade. He is in Service and Supplies and has just completed a two-months' course at the Navy Supply Corps School at Babson Park, Wellesley. He is now attending the Navy course given at the Harvard School of Business Administration. His wife and daughter, Eleanor Ann, are dividing their time between the Howard Fessendens (M.I.T. '13) in Newton Center and the Calvin Eldreds in Dedham."

Clarence Dow, I, with a new address, 367 Brooklawn Drive, Rochester 10, N.Y., wrote: "After two years of mechanical inspection work with the Navy, I had had enough and so asked for and obtained my release. After enjoying myself during the summer, I moved to Rochester, N.Y., and am now a manufacturers' agent. The Spencer Turbine Company, Hartford, Conn., is my main account and I cover all the Northwestern counties of New York, doing a lot of work with Eastman Kodak, Bell Aircraft, and Curtiss-Wright on turbocompressors and vacuum producers. It is very interesting work, and I meet a lot of Technology men in my travels."

Undoubtedly all of you read Fred Fassett's fine story, "Tools for Teaching," in the initial (November) issue of the current volume of The Review, describing the means and methods which the Navy is using to train fighters . . . under the dynamic leadership of Luis de Florez, II, a captain and director of the special devices division in the Bureau of Aeronautics. Now, thanks to a tip from Aleck Yereance, I advise you to buy, beg, borrow, or steal copies of the *New Yorker* for November 11 and 18, for therein you'll find a delightful two-part "Profile," with two swell caricatures for good measure, of our own Monk de Florez. His life story, as unfolded in this well-written opus, is truly delightful. Don't miss it! Aleck also tells me that, like Stan and Julia Hartshorn, he and his wife have a daughter in the armed services, a lieutenant, junior grade, in the Women's Reserve of the Coast Guard Reserve.

Harry Tisdale, V, has likewise called to my attention in *Life* for November 13 a fine full-page picture of Lieutenant General George Kenney, I, standing with General MacArthur on the deck of a cruiser before the landing in Leyte. He enclosed a clipping from the *World-Telegram* of November 15, which stated, "MacArthur learned much about air-power from Canadian-born Lt. Gen. George C. Kenney, whose forcefulness and imagination spotted the key position and who 'lifted' the troops over the mountains to drive the Japs from New Guinea." Our congratulations to you, Harry, on your recent election as vice-president of the American Dyewood Company!

Louis L. Wetmore's address is now 145 Cypress Street, Newton Center 59, Mass. — The season's heartiest greetings to you and you and YOU! — Orville B. Denison, *Secretary*, Chamber of Commerce, Gardner, Mass. John A. Herlihy, *Assistant Secretary*, 588 Riverside Avenue, Medford 55, Mass.

1913

Larry Hart, XI, spoke this fall, in Greenville, S.C., before the local branch of the National Office Management Association, and I had the good fortune to be a listener. His talk, on the subject of human relations, was originally given in New York, and later in Philadelphia and Washington. This subject, as you will realize from its name, covers a lot of territory, and I was keen to find out how he would bring it down to earth, as I knew he would. He gave many examples and maxims, good meaty ones, and he covered many situations, ranging from an interview with a man looking for work on up to the problem of an executive who has a ticklish job to sell his idea to the boss. Larry doesn't look his

age, being without a gray hair and few, if any, missing, and only 10 pounds heavier; reading his notes without glasses, he looked from a distance almost the young man who presided at our class dinner at the Union in 1912.

Arthur Townsend, II, reports that he had a nice chat in Taunton with Bion Pierce, X. Bion runs the big hardware store in Taunton. His boy is in the Navy, on a landing ship, probably somewhere in the southwest Pacific. He has an electrician's rating, having had training at Newport, Great Lakes, and Norfolk. Arthur ran into E. B. Cotton, II, in front of the Parker House, and also saw Bob Tullar, II, at the Institute. Bob told him about the important job he has with RCA Victor at Camden and how he goes to Technology every year to pick some boys for jobs. He looks swell, and his daughter entered college this fall.

Bob Weeks, VI, dropped in lately, well and full of pep. He is running his own business in West Chester, Pa., making small towers for radio and beacons, and is busy with war work. He is doing some ingenious things with wire cable and seems to have all the bounce that he needed when he started to peddle ads for the Tech Show program.

Nat Sage's daughter Barbara was married November 18 to Carl Barus, a lieutenant in the Naval Reserve, at St. Paul's Church in Brookline, Mass. Ed Gere, I, a colonel in the Army, has been transferred to Washington, from Silver Springs, Md. Don Van Deusen, II, a major in the Transportation Corps, is located in Washington, at 2126 Connecticut Avenue, Northwest. Gene Macdonald, I, has moved to Princeton, N.J. Alan Means, III and XII, an Army colonel, has been transferred from Phoenix, Ariz., to Salt Lake City. Walter Merrill, XI, is back in Medford, after duty overseas.

The season for giving to the Alumni Fund is still open, and we need more givers. We don't ask a man to give more than he can afford, and under this low-pressure approach, it is your duty to give something, if you can. Please mail your check, today, to the Alumni Fund, at M.I.T., Cambridge. — FREDERICK D. MURDOCK, *Secretary*, Murdock Webbing Company, Box 788, Pawtucket, R. I.

1914

All members of the Class join in an expression of sympathy to Leigh S. Hall of Concord, N.H., on the death of his son, Leigh, Jr., in an airplane crash at Wright Field, Ohio. Leigh, Jr., was the first of our sons to be graduated from the Institute. Receiving his degree in 1939, he took part that year in the celebration of our 25th reunion. Leigh's second son, Sidney, was graduated in the Class of 1943 and is also stationed at Wright Field. Leigh, Jr., was a first lieutenant and Sidney is a second lieutenant in the Air Corps. Both boys had been doing a lot of test flying together but fortunately, at the time of the accident, Leigh was flying alone.

Leigh, Jr., entered the Air Forces in January, 1942, and after basic training in Texas, where he received his wings, he was stationed at Wright Field. He had been sent on a special assignment out of the United States but had returned to Wright Field. As nearly as can be determined, the cause of the accident was a failure of the oxygen supply while conducting an engine test at extremely high altitude.

While our section of the Alumni Fund is not doing quite so well as last year, it is still coming along nicely. As this year's solicitation is drawing to a close, Ross Dickson would greatly appreciate hearing from any classmates who have overlooked their proposed contribution. The Fund as a whole is doing very well and will be instrumental in keeping Technology in an outstanding position in the field of engineering education in the postwar period. — H. B. RICHMOND, *Secretary*, General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Mass. CHARLES P. FISKE, *Assistant Secretary*, 1775 Broadway, New York 19, N. Y.

1915

Holiday greetings to all my classmates. There are only a few left who gave last year to the Alumni Fund but not thus far this year. One hundred forty-six (84 per cent) have contributed $2,644.50 (90 per cent). Keep up the good work. Let's hit that 100 per cent quota immediately.

This letter from San Willis tells you about his new job: "I am out here in St. Louis setting up a postwar product development program for the Mississippi Glass Company and will probably be here for some time. So far I have been unable to locate any Tech men hereabouts — let alone any from our Class. Do you know of any, or whether there is a Tech club here? . . . I wrote my mother asking her to get in touch with you relative to the above, but you gay bachelors must be on the go all the time — at least there was never any answer at your apartment." Any of the boys going to St. Louis would do well to see San. His address is Fairgrounds Hotel, St. Louis 7, Mo. — From 152 Temple Street, New Haven 3, Conn., Vincent Maconi writes: "My 25th wedding celebration in September was a complete success. I hope you will find your way down here so I can show you how friendly New Haveners are. We have taken some more Tech men into our local Kiwanis Club, bringing our total to eight." Incidentally, Vincent is president of the New Haven Kiwanis Club.

To all our men in the armed services we have written a Christmas letter carrying to them the warm and deep wishes of our classmates for a happy holiday season wherever they are and whatever they're doing. — I leave you to judge the thrill of getting a postcard from Paris, dated October 8, from Jim Tobey. "I have been in France for several weeks and have managed to see something of the world's most beautiful city, as well as some of the combat areas. Regards to all 1915 men."

And then, from St. Elmo Ian MacTower MacPiza, a picture of himself in full Scottish regalia — spats, rolled stockings, whisk broom, plaid shawl, and Black Watch skull piece — bravely holding a dull sword, taken somewhere in Scotland and followed by this soul-stirring epistle in V-mail form. It's so typically humorous of him that we simply could not concur with his request to omit any part of it, and so we've given it all to you: "You would be perfectly justified if, after this unconscionable lapse, you had cut me completely off your list of friends and stricken me from the roll call of 1915. But I hope you have not done so . . . . I have two letters of yours from last Christmas and another dated May 25. The fact that I have not answered sooner is not that you have been out of mind, but only because of a government job. When you cannot talk about your work in a small town in wartime England, it's about the most restricted existence imaginable. They take in the sidewalks at black-out (4:45 in midwinter; 11:00 in midsummer); all transportation ceases at 9:00 P.M. There are no secluded places to park, even without a car, which nobody has, and the nights, even in summer, are mostly chilly and damp, and swathed as I am in four thicknesses of wool, there would be no point or reason for parking anyway. In fact, the longer I live here the more deeply I am convinced that the whole fabric of English civilization is a carefully-knit, all-encompassing, and successful conspiracy to inhibit and deflate the amatory instinct. Of course, I hear you say, 'He's getting old and just won't admit it!' But I'm not *that* old, and I can prove it. There was a 10-day leave in Scotland, for example — but — oh well, that's another story, and it takes a lot of telling. Don't publish my medical theory; I have to get more data, and besides The Review comes *here*. I've seen copies. So spare me please. I'll send you another line soon."

On December 8, in Boston, we're having a first general committee meeting to arrange plans for our 30th reunion next June and in next month's notes you will read the full details. Meanwhile, you will undoubtedly have received the first notice. Remember what I told you about "help, help," and see how short our column is getting! — AZEL W. MACK, *Secretary*, 40 St. Paul Street, Brookline 46, Mass.

1916

Dick Fellows has recently been transferred from the Bayonne, N. J., plant of the General Cable Corporation, where he was plant superintendent and technical superintendent, to the Emeryville, Calif., plant of the same company, where he is employed in the same capacity. His work has been in the development and manufacture of high-voltage, underground, paper-insulated cables. He has a married daughter and two grandchildren. His boy is in the V-12 naval training program at the University of Colorado.

Robert E. Wilson, Bob to those who were at our 25th reunion, has just been promoted to become chairman of the board and chief executive officer of the Standard Oil Company of Indiana. He will remain a director and become chairman of the executive committee of the Pan American Petroleum and Transport Company. Let us hope that these new and important duties will not keep Bob from attending our 30th reunion in 1946, which most of us hope will again find us at the Oyster Harbors Club, near Cotuit, Mass.

No news of Dave Patten has reached your Secretary. Any classmate who has received word from him since he went to the southwest Pacific — please inform your Class Secretary. — JAMES A. BURBANK, *Secretary*, The Travelers Insurance Company, Hartford, Conn. STEVEN R. BERKE, *Associate Secretary*, Berke-Moore Company, Inc., 11 Boylston Street, Brookline 46, Mass.

1917

Walter C. Wood, a lieutenant commander in the Coast Guard Reserve, was married on October 16 to Helen Westerdale at Edgewood, R.I. — Roger Putnam, former mayor of Springfield, Mass., and recently on active naval service as lieutenant commander, has been appointed deputy director in the Office of Contract Settlement. Since early October he has been in Washington as a special adviser to Director Hinckley of this office. — From New York comes word that Enos Curtin has recently been elected vice-president of Blair and Company, Inc., 44 Wall Street, New York, and Enos himself (together with Sherry O'Brien, Penn Brooks, and the publisher of The Review) graced the head table at a luncheon of the Technology Club of Chicago on November 28. — I. B. Crosby reports that he is soon to leave his work for the Navy and also sends us the report that Gilbert A. Hunt was on duty as a captain in the Bureau of Yards and Docks, Navy Department, Washington, until last spring. Hunt has recently returned from a special mission to Liberia and is now on duty in Boston on the staff of the superintending civil engineer in the Park Square Building.

Dick Loengard recently spent a few hours with your Assistant Secretary at Exeter, during the course of which he renewed his old acquaintance with Frank Kanaly, who has been at Exeter for the last two years as coach of track athletics. It might be added that Frank failed to live up to his reputation for remembering all his old performers in Dick's case, thus causing your Assistant Secretary a loss of confidence in Frank's reputation, together with a small wager, as the years seem to have touched Dick more lightly than others. With all good wishes to you all for the New Year. — Raymond Stevens, *Secretary*, 30 Memorial Drive, Cambridge 42, Mass. Philip E. Hulburd, *Assistant Secretary*, Phillips Exeter Academy, Exeter, N.H.

1919

Earl P. Stevenson, President of A. D. Little, Inc., has been elected a member of the board of trustees of Wesleyan University. — Kenneth S. M. Davidson received an honorary degree of Doctor of Science from Stevens Institute of Technology in June.

Webb Patterson was discussed in Neal O'Hara's column in the Boston *Traveler* in October. He was quoted as stating that if a belt were placed so that it fitted closely around the earth at its equator and then one foot were inserted to make it one foot longer, it would stand out approximately four inches all around the earth. Patterson explains that the effect would be due to the constant ratio between the diameter and circumference of a circle. Much correspondence came in saying that the belt would stand out only two inches instead of four inches.

Ev Doten writes us: "You and the committee did a grand job on the reunion. I'm so glad I made the effort to attend."— Royden L. Burbank says: "I was glad to get your announcement saying the 25-year reunion was a huge success and to read the account of it in The Review."

Willis C. Brown, 208 Spring Street, Chevy Chase 15, Md., writes that his son, Ralph, is with an infantry unit on the European front. — William F. Bennett, Jr., is a lieutenant in the Naval Reserve. — William H. Bassett, Jr., of the Ordnance Department, sent in a change of address from Cincinnati, Ohio, to Army Service Force, Springfield Ordnance District, 95 State Street, Springfield 3, Mass.

Al Richards attended the Class Day ceremonies and heard Will Langille speak for our Class at New England Mutual Hall on October 28. — Harold W. McIntosh has been made class decade representative for Classes 1921 to 1930 for the Technology Club of Hartford, Conn. — Eugene R. Smoley, *Secretary*, The Lummus Company, 420 Lexington Avenue, New York, N.Y. Alan G. Richards, *Assistant Secretary*, Dewey and Almy Chemical Company, 62 Whittemore Avenue, Cambridge 40, Mass.

1920

When Norrie Abbott notified your Secretary that he and Johnnie Nash would be in Boston the next day, a hurry call was sent out to assemble the group for a meeting on the big reunion. Ten were reached and ten showed up at the meeting, which augurs well for the interest in and enthusiasm for our 25th. Those present included Akers, P. Bugbee, Burke, Cofren, Gibson, Patterson, and Ryer. Responsibilities were delegated, and we expect to give you the complete story by mail any day now. In fact, you may have the word before this appears in print. In passing, let me say that if this group is at all representative, the quarter century since graduation has not dealt unkindly with us, and there will be life enough in the old gang to make it a reunion worth remembering for another 25 years. Al Glassett, Vice-president of the Alumni Association, has been attending Alumni Council meetings this fall and expresses great interest in the reunion in behalf of the New York crowd. Al forwarded me a recent letter from Chick Dana also expressing interest in the reunion and indicating that he would join Al and some of the other New Yorkers in promoting the affair. Chick's address is 2 Broadway, New York.

We picked up the news from Norrie that Buz Burroughs has been promoted to the rank of lieutenant commander and is in charge of personnel at the Torpedo Station, Newport, R.I.

W. Kenyon Lloyd, a major, has received his honorable discharge from the Army Air Forces and has been appointed assistant general counsel of the American Casualty Company in Baltimore. George Burt is still with the Celotex Corporation but has left New Orleans and is in Chicago at 120 South Lasalle Street. Raymond B. Collerd, a captain, is in San Francisco, address 1760 16th Avenue. Amasa Castor, a major, and Leland Gilliatt, a lieutenant colonel, are both overseas with A.P.O. addresses out of New York.

Heinie Haskell has been raised to the rank of commander, and Robert Hayler is now a rear admiral, having been recently promoted from captain. Art Littlefield has left Washington and is now in St. Louis; address, Route 4, Box 57D, Baden Station. John Bartholomew is in Detroit, at 504 Maccabees Building. Arthur Dopmeyer is a lieutenant colonel, located at 1407 United States Appraisers Building, San Francisco. Dolly Gray is back in Connecticut; address, 18 Middlefield Drive, West Hartford. Bob Van Volkenburgh, a brigadier general, is at Camp Stewart, Georgia.

As we go to press, word is received of the sudden death on November 29 of Bill Hedlund of Summit, N.J. Bill was president of the Elastic Stop Nut Corporation. According to a statement made by the company, "He had taken over its management at a time when the critical demand for its products was at the peak. He succeeded in building up the company to meet the demands for production made by the war program. He had devoted all of his energies to the end of meeting the demands made upon the company and had overworked himself to the point of complete exhaustion, resulting in a nervous breakdown. Despite his illness, he endeavored to carry on his duties because of the importance of his company's products to the fighting forces. The strain, however, proved too great." Bill was previously vice-president of engineering with the Electrolux Corporation and was regarded in legal and industrial circles as a patent authority. He leaves a wife and daughter. Most of us will remember Bill Hedlund, his brilliance as a student, and his musical contributions to the Tech Shows. His death comes as a great shock, and his loss will be sincerely felt by us all. — Harold Bugbee, *Secretary*, 7 Dartmouth Street, Winchester, Mass.

1921

Asher Z. Cohen, X, sent a welcome letter apprising us that he has been promoted from lieutenant colonel to colonel in the Ordnance Department. Asher is commanding officer of the Delaware Ordnance Depot, Pedricktown, N.J. He was called to active duty early in 1941 and has been assigned to the Pedricktown depot for several years. In Washington we learned that Joseph A. Mahoney, X, has been promoted to lieutenant colonel in the Signal Corps and that Robert B. P. Crawford, XIV, is a lieutenant commander assigned to the OPM offices in the Navy Building. — Members of the Class have received two new decorations. Stanley L. Scott, I, a brigadier general, has been awarded the Distinguished Service Medal. Ludson D. Worsham, I, also a brigadier general, has been given the Legion of Merit award. Previous awards include three Distinguished Service Medals, three Legion of Merit awards, and one Purple Heart. — Maxwell Murray, II, the first of the Class to reach the rank of major general, has added new laurels to his long military career as commanding officer of the Southern California sector of the Western Defense Command. — James B. Newman, Jr., I, is also in the news as the brigadier general in command of the 9th Air Force Engineer Command whose job it is to build, repair, and maintain airfields close behind the ground troops. His bulldozers, graders, scrapers, and all the rest of the heavy machinery must tread right on the heels of the advance, and sometimes they are even ahead of it. He thinks nothing of building a complete field in 27 days, including two 5,000-foot runways, hard stands for planes, facilities for gasoline and other requisites, and then moving troops and equipment several hundred miles on the 28th day so as to start work on a new field on the following day.

Aimee Hawes, daughter of Munroe C. Hawes, X-A, tells us that we neglected to introduce the latest arrival by name in the announcement in the November issue. George Daniel Hawes is the young fellow who will be following in Dad's footsteps about 1963, making Technology history on the revivified rifle team, crew, and Tech Show. — A. B. Kinzel, IX-B, has been appointed vice-president of the Electro Metallurgical Company with headquarters in New York City. Gus was formerly the chief metallurgist of the Union Carbide and Carbon Research Laboratories. — Harold M. Estabrook, II, has been appointed to administrative duties in the Philadelphia head office, supervising the New England operations of the Fire Association Group. Harold entered the insurance business in 1921 with the Boston firm of Patterson, Wylde and Windeler. In 1937 he became special agent of the Fire Association Group for Massachusetts and Rhode Island. He is chairman of the executive committee of the New England Insurance Exchange, a former president of the Bay State Club, and a former selectman of his home town of Arlington, Mass.

Philip H. Hatch, VI, now general mechanical engineer superintendent of the New York, New Haven and Hartford Railroad, is chairman of the transportation group of the New York section of the American Institute of Electrical Engineers. On November 14, Phil was one of the speakers who presented a symposium on the subject, "Production Line Maintenance of Electric Traction Equipment." He has been active in the application of Diesel-electric motive equipment for use in transporting both passengers and freight. — Louis Mandel, II, has changed his home address to 486 Longview Drive, South Orange, N.J. We are not listing address changes for military personnel since mail for members of the armed forces will be readdressed if it is sent to the Alumni Office at Technology. — Start the New Year right — send news of yourself and your neighbors to your Assistant Secretary. — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, Federal Telephone and Radio Corporation, 591 Broad Street, Newark 1, N.J.

1922

William W. K. Freeman, a lieutenant in the Naval Reserve, stationed in the Pacific, has dropped a post card sending his greetings to all the Class. He recently had a three weeks' leave, which was altogether too short to visit all his friends and says he hopes the next time will be 30 days, or preferably a permanent leave. — Thomas H. West, II, has been elected president of the Draper Corporation, Hopedale, Mass., one of the country's largest manufacturers of textile machinery. After he was graduated, he spent a year in various textile mills and in 1923 went with Draper Corporation in the sales department. He became a director in 1931 and vice-president in 1938. We congratulate him on his success and wish him clear sailing through the troublesome years ahead. His son, Thomas H. West, Jr., was graduated from Groton and has entered the Navy.

With sincere regret and sadness, we report the deaths of two of our classmates and extend to their families the sincere condolences of the Class. — Edward V. Carroll, II, died on June 22 at his home in Fall River, Mass. He had been principal of the Bradford Durfee Textile School in Fall River for the past two years and a member of the faculty since graduation.

Dwight Gray passed away on October 31 after an illness of several months. Gray was vice-president and treasurer of Pope and Gray, manufacturers of special ink in New York City. On graduation from Course V, Gray took a position as chemist with Philip Ruxton Company, ink manufacturers in Brooklyn. In March, 1927, he joined with Chester Pope '09, to form the firm of Pope and Gray, which has become an important producer of ink for special and difficult purposes. Gray attended our 20-year reunion and was present in February at the Alumni Day activities held in Cambridge. In the spring of last year, he began to suffer from a lung ailment from which he was unable to recover. He leaves his wife, mother, a brother, and a sister. — CLAYTON D. GROVER, *Secretary*, Whitehead Metal Products Company, Inc., 303 West Tenth Street, New York, N.Y. WHITWORTH FERGUSON, *Assistant Secretary*, Ferguson Electric Construction Company, 204 Oak Street, Buffalo, N.Y.

1923

Jack Keck has carried on for several years as Assistant Secretary, supplying items principally from the Greater New York area. He has now asked to be relieved of this responsibility, which has become more than he feels he can maintain in view of deafness and other disabilities, the result, his friends will remember, of an injury. We are indebted to Jack for sincere, conscientious work, and I have expressed the thanks of the Class, as well as my personal appreciation of what he has contributed to these columns.

Now, is there someone who will volunteer to take his place? I should like to hear from one of you, particularly in the Greater New York City area, or in Washington. These are the geographical centers, away from Boston, where classmates congregate and from which we should have regular notes in this column. — HORATIO L. BOND, *Secretary*, 457 Washington Street, Braintree 84, Mass.

1926

The 1926 man who has been most in the public news of late is Lieutenant Colonel A. W. K. Billings, Jr., a civil affairs officer in the Army who was placed in charge of Rotgen, the first German town to be occupied by American troops. Said a recent newspaper report: "Billings believes there will be no trouble with ordinary German civilians. He does fear the possibility the Nazis may leave behind agents in civilian clothes. But so far in this area no hostile actions have been reported against our troops. The colonel, who is a heavy, round-faced man of 43, runs the town and the surrounding area with the help of four other officers and nine enlisted men. He does not speak German, but has several interpreters. He has been doing civil affairs work in France since D-Day and had previously taken a course in military government in the United States. His job here differs considerably from the one he had in France. There he acted in an advisory capacity, his function being one of liaison between the Army and local authorities. Here he actually rules." Before going with the service of the Allied Military Government, Ken was intelligence officer in the 26th Division, having served with the Massachusetts National Guard 10 years prior to the war.

The Secretary was delighted to receive news of the marriage of Bill Rivers on October 14 at Colombo, Ceylon. His wife is the former Margaret Gillies, 3d officer in the Women's Royal Naval Service and daughter of Sir Harold and Lady Gillies of London. — Dick Plummer has recently been in Washington doing work with the Rubber Reserve Company, presumably on temporary leave from his post in Buenos Aires. — The Secretary was sorry to have missed W. H. Reed when he recently stopped at the office. He is with the Koppers Company.

E. B. Godley has written as follows: "Last spring I entered the service of the Lukas-Harold Corporation, which is part of the Carl L. Norden Company and is a Naval Ordnance plant in Indianapolis. My position is that of senior product engineer attached to the laboratory. We are working on several projects of a highly interesting and, of course, confidential nature. Suffice it to say, the work is mostly concerned with the development of new fire-control equipment, particularly as applied to aircraft. Several very promising developments are under way which we hope may be produced soon enough to have some effect in shortening the Pacific war. The plant itself is practically the answer to an engineer's dream in newness and efficiency of layout. At the present time we are producing very sizeable quantities of computing gunsights, as well as the famous Norden bombsight. It is, of course, gratifying to be associated with such work, and we in the laboratory hope to continue developments far into peace time."

Peter L. Bellaschi, of the Sharon, Pa., laboratories of the Westinghouse Electric and Manufacturing Company, has recently been in South America on a tour which is to help co-ordinate inter-American industry through science. Says a statement from the Westinghouse Company: "Dr. Bellaschi's accomplishments in the field of engineering science have been numerous. His experiments with lightning both natural and man-made, have attracted wide attention. His artificial production of lightning strokes containing long-duration, low-current discharge — the so-called 'hot lightning' that burns as well as explodes its target — has aided in development of surge-proof power and distribution and instrument transformers, and has contributed to the development of impulse testing techniques and sphere gap calibrations.

"A native of Italy, Dr. Bellaschi came to America with his family when a boy. In 1922 he enrolled in the electrical engineering course at the Massachusetts Institute of Technology. He was graduated in 1926 and received his master's degree two years later while on leave of absence from his position as an engineer at the East Pittsburgh Works of Westinghouse, where he was specializing in research and development in the field of high voltage transmis-

sion and insulation engineering. In 1929 he was transferred to the Sharon Transformer Division of the Company where much of his development work dealing with lightning phenomena and methods of protecting electrical equipment from it has taken place.

"He has contributed many technical papers on lightning and protection which have been published in the proceedings of the American Institute of Electrical Engineers and in technical journals abroad. He holds membership in the American Institute of Electrical Engineers, the Association for the Advancement of Science, the Franklin Institute of Pennsylvania, the International Congress of High Tension Systems, and other electrical engineering associations in England, Italy, France, Switzerland and Argentina. In September 1936, Dr. Bellaschi was given the Westinghouse Order of Merit, the Company's highest award, for his outstanding research work; and in 1940 Washington and Jefferson College awarded him an honorary degree of Doctor of Science in recognition of his contributions to electrical science."

D. B. Powers is a lieutenant colonel in the Office of Air Engineers in Washington. — The President of the Technology club in Worcester brought Roger Smith down from Gardner to a recent meeting of the club. Roger, together with Bob Dawes and Charlie Rich, formed a '26 contingent that staged a pleasant reunion and gave the Secretary a very hearty welcome. — Marron W. Fort was graduated last June from recruit training at the Great Lakes Naval Training Center as honor man of his company. He was elected candidate by fellow Negro bluejackets and selected honor man by his company commander on the basis of military aptitude and progress.

Announcement was made this past summer of the appointment of Bill Forrester as vice-president of the National City Bank of New York. — In October, Carleton Everett, formerly of New York City, was appointed director of refining in the Atlantic coastal states by the Petroleum Administration in Washington. — James R. Killian, Jr., *General Secretary*, Room 3–208, M.I.T., Cambridge 39, Mass.

1927

Your Secretary made the mistake of putting all the notes which had accumulated over the summer in the November issue. He was then left with nothing but a few new addresses for the next month, making our December notes conspicuous by their absence.

The Newark, N.J., *News* recently carried the following with reference to the marriage of "P.C." Eaton, who, before entering the service, was an assistant professor of English at the Institute: "Mrs. James A. Emery of North Mountain Avenue, Montclair, has announced the marriage of her daughter, Miss Katherine Drewry Emery, to Lt. Paul Conant Eaton, USNR, son of Mr. and Mrs. Ivory Eaton of Nashua, N.H., September 23 in San Francisco. Mrs. Eaton is a graduate of Sweet Briar College and a member of the Junior League of Montclair. After playing leading parts in Junior League and Montclair Dramatic Club performances she played in 'The Children's Hour,' 'As You Like It' and 'The Cherry Orchard' on Broadway. She has also appeared on the radio and in 'Eyes in the Night' in movies."

Those of you who read the October 23 *Time* saw the description given there of the tremendous potential postwar demand for industrial machinery in almost every foreign country. It pointed out that the Foreign Economic Administration would play a dominant part in the export trade which would result from this prospective demand. It referred as follows to Oscar S. Cox and to his part in F.E.A. activities: "Last week Oscar Cox, FEA's general counsel, was still studying a letter drafted in the White House. The letter, from Mr. Roosevelt to FEA's boss, Leo Crowley, outlined the postwar duties of FEA. Cox, 38, whose hobby is mountain climbing, has a nimble and imaginative legally trained mind (M.I.T. and Yale Law School), which enables him to have a finger in every Washington pie. He wrote the first draft of the Lend-Lease bill in 20 minutes, then filled in the details in two and a half hours. Last week Cox said the President's letter will become the guiding policy of postwar foreign trade for the U.S. The Policy: whenever necessary FEA will underwrite the trade, while private industry will produce and ship the goods."

Here follows a list of class members recently promoted in the armed forces, showing their new ranks and most recent addresses: Commander Volney C. Finch, Naval Air Station, Lakehurst, N. J.; Lieutenant Colonel William R. Frederick, Jr., Headquarters USA FISPA, A.P.O. 502, care of Postmaster, San Francisco, Calif.; Major Robert T. Connor, 208th Army Antiaircraft Group, A.P.O. 920, care of Postmaster, San Francisco, Calif.; Major Samuel F. Hershey, 900th Army Air Force Battalion, AAFSAT, Orlando, Fla. — Following are other new addresses, of which some have accumulated since summer:

Carl H. Anderson, 280 Genesee Street, Utica 2, N.Y.; Lieutenant Richard L. O'Donovan, CBMU 586, care of Fleet Post Office, San Francisco, Calif.; Kenneth C. Vint, 1118 South 33d Street, Birmingham, Ala.; Lieutenant Colonel Carl H. Wies, 756 Pequot Avenue, New London, Conn.; Alan S. Beattie, Route 2, Mount Kisco, N.Y.; Emory F. Patterson, Great Lakes Steel Corporation, Terre Haute, Ind.; Darcy A. Young, Jr., 51 Seneca Parkway, Rochester, N.Y.; Professor Lloyd A. Bingham, 870 Twelfth Street, Boulder, Colo.; Lieutenant Colonel Ernest W. Carr, U.S.A., O.C.E, GHq., A.P.O. 500, care of Postmaster, San Francisco, Calif.; Gaillard Hunt, Jr., 51 East 97th Street, New York 29, N.Y.; Fordyce Coburn, "Doneraile," Greenfields, R.D. 2, Reading, Pa.; Charles G. Drew, La Salina Refinery, Creole Petroleum Corporation, Apartado 172, Maracaibo, Venezuela; Harry Falkoff, Box 146, East Haven, Conn.; Captain James D. Flagg, 58 Elizabeth Apartments, Chattanooga 3, Tenn.; J. Burns McClure, R.D. 1, Box 108, Hedgewood Lane, Schenectady, N.Y.; Edwin J. R. Moulton, 302 Dewittshire Road South, De Witt, N.Y.; Mather Garland, care of Roto Plow Company, Mound, Minn.; Major R. Folsom Hayward, Headquarters Second Air Force, Colorado Springs, Colo.; Captain Thomas J. Scott, Chemical Office A.P.O. 927, care of Postmaster, San Francisco, Calif.; Charles W. Snow, Blanchard Snow and Watts, 115 Broadway, New York, N.Y.; Lieutenant Colonel Isaac W. Stephenson, Headquarters Army Air Forces, Room 4-C, 858 Pentagon Building, Washington 25, D.C.; Paul S. Vaughan, 2326 Story Avenue, Schenectady 8, N.Y.

These being the first notes for 1945, they carry best wishes for the coming year. Incidentally, as the years roll by, have you wondered how our Class looks to the Institute's crop of freshmen? Well, the present freshmen see the Class of 1927 as we saw the Class of 1906! If you don't believe it, figure it out. — Joseph S. Harris, *General Secretary*, Shell Oil Company, Inc., 50 West 50th Street, New York, N. Y. Dwight C. Arnold, *Assistant Secretary*, Stevens-Arnold Company, Inc., 22 Elkins Street, South Boston 27, Mass.

1930

Bill Spahr, VI-A, an Army major, was married in May to Muriel Deutzman of Smithtown Branch, L.I., Bill's home town. — Al Bird, XIII, and his wife are the happy parents of a son born in August. This makes the third child and the first son. Al is an engineer with the Bureau of Ships in Washington and is very active in the affairs of the local alumni group there. One of his fellow workers at the Bureau is Fred Turnbull, XIII, who was previously an examiner at the United States Patent Office. — Bill Driscoll, XVI, has returned to the staff of the Supervisor of Shipbuilding at Quincy, Mass., as a lieutenant. Homer Davis, VI, a lieutenant-colonel in the Army with headquarters at the Panama Canal, was recently selected to undertake special study in Chicago. His wife and two children, a boy and a girl, live in the Canal Zone. — Our congratulations to Bill Spahr, Al Bird, and to the many classmates who have been advanced in rank in the military service. The latter are too numerous to mention, but letters from any or all of them will receive fitting recognition in these columns. The same applies to all other classmates, who seem to have been unusually reticent about their accomplishments in recent months. — Meanwhile, remember the Alumni Fund and the share our Class must bear in reaching the goal that has been set. — Parker H. Starratt, *General Secretary*, 1 Bradley Park Drive, Hingham, Mass.

1932

Did you know that the leader of "Merrill's Marauders" in Burma, Frank D. Merrill, a brigadier general in the Army, received his degree with us in 1932? I didn't, until a newspaper clipping mentioned it and a look in "Technique" confirmed it. — F. R. Morral, formerly industrial fellow at the Mellon Institute of Industrial Research in Pittsburgh, has gone to Stamford, Conn., where he works for the American Cyanamid Company, as group leader of the metal trades laboratory of the technical service and development division. — Walter C. Voss has been appointed a member of the National Panel of Arbitrators of the American Arbitration Association, which maintains a system of commercial arbitration tribunals for the voluntary settlement of civil and commercial controversies. — Tom Sears, a captain in the Army, and Mrs. Sears have announced

the birth of a daughter, Joan, on November 8. — CLARENCE M. CHASE, JR., *General Secretary*, 1207 West 7th Street, Plainfield, N.J. *Assistant Secretaries:* CARROLL L. WILSON, 1530 P Street, N.W., Washington, D.C. WILLIAM A. KIRKPATRICK, Allied Paper Mills, Kalamazoo, Mich.

1936

Even though I can hardly believe it myself, here is our Class in the class notes column. How do we happen to be back after so long an absence, and where have we been for so long? There is no adequate answer. Those of us who aren't in the armed forces have been kept pretty busy with war work, it is true, but other classes have had a good write-up each month, and why can't we? Again, I won't make any excuses. But a short time ago at a meeting of the M.I.T. Association of Buffalo, my reporting instinct was reawakened when I talked with Elliott Robinson and Dick Koegler and heard all the news which they had to tell. Elliott had received a note mailed from Salt Lake City, Utah, from Mr. and Mrs. Frederick Carleson announcing the marriage of their daughter, Choral Luana, to Brenton Webber Lowe, a lieutenant in the Naval Reserve, on October 11 in New York. We all offer our congratulations. Brent was last seen in Washington, D.C., when Dick Koegler had barely time to shout hello to him at the Bureau of Aeronautics.

After serving for a while as a private in the Medical Department, Fred Assmann finally got a break and became a first lieutenant with the Chemical Warfare Service. His most recent letter to Elliott came from somewhere in France where Fred was taking a short rest back from the front lines. He's having a chance to try some of his French that we learned in school and so far hasn't been doing too well. But he manages to make himself understood. He was surprised to find people still living in their homes right at the front and well within the range of mortar fire. — George Ray was engaged to marry Nancy Humphrey, I believe, of Buffalo, with the wedding scheduled for December 2. George is in the stress department at Bell Aircraft and has recently returned from six to eight months in Russia, where he was working on the P-39. He has written an article on his trip and findings which was published in the April *Aviation*.

Henry Runkel is a project engineer at the St. Louis Curtiss plant. He is married and has a daughter, Barbara. — John P. Hamilton is in Buffalo at the laboratory of the Linde Air Products Company and is reported by Dick Koegler to have done an excellent job in developing a new plastic. Jack was married in July to Harriet Kennedy of Buffalo. Dick reports that Jack is part owner of a monocoupe airplane, but according to my information, Jack never got a ride in the plane before the other owner cracked it up. Before he was married, however, Jack did quite a lot of flying and is still very active in the Civil Air Patrol. — Larry Lombardi is at the Kenmore Plant of Curtiss in the materials review section of stress analysis. He alternates between night shifts and day shifts and at the time of this writing he was, to say the least, pleased to be completing a turn on the night shift. Ed Dashefsky is the project engineer at the same plant. He is married to the former Rose Zelermyer of Boston and has a daughter, Gloria, born about two years ago. To complete the news about Ed, we should mention that he had an appendectomy in August.

Ariel Thomas is married and has two children; Ann is four years old, and Lee is two. Ariel is doing special service work for the Army. Johnny Chapper is head of the stress section at the St. Louis Curtiss plant. — Johnny Drew has just completed and issued a very thorough study of the probable trend of air transportation after the war. This report has had wide circulation throughout the aircraft industry and has both received wide praise and caused much discussion. The work was done for the Curtiss-Wright business research department. Johnny has seen Yank Spaulding at the Bureau of Aeronautics. Yank is doing analysis of all types of naval aircraft. Charlie Shubart is also at the Bureau of Aeronautics, connected with the commission on transport. — Hank Cargen is at Wright Aeronautical in Paterson, N.J. He is head of the sales research department — some change from getting pictures of brides for soap ads! Jack I. Hamilton is assistant to the sales manager at the Curtiss propeller division. Fred Flint is on the Curtiss Wright airplane division staff. His work is connected with the co-ordination of the work of the various plants forming the Airplane Division. He is married to the former Virginia Gramlich.

We certainly owe a vote of thanks to Elliott Robinson and Dick Koegler for the foregoing information. Elliott is now assistant head of the materials process section at Curtiss Buffalo Plant No. 2. This section includes the engineering laboratories of that plant. He is married to the former Elizabeth Sylvester, of Brookline. Dick Koegler is chief of the design strength section at the same plant.

Now to pass along some of the recent information which our clipping bureau has provided. Kathleen Shott is a first lieutenant in the Women's Army Corps and was recently stationed at the Army Air Forces Overseas Replacement Depot, Kearns, Utah, where she was assigned to the Regional Hospital as a bacteriologist. In civilian life, she was employed as a bacteriologist for the American Sugar Refining Company in Boston. — H. Page Cross, a captain in the Marines, has recently returned to this country after some exciting action in the South Pacific. As an aviation ground officer, he was stationed, during his stay overseas, on Vella Lavella, Treasury Island, Bougainville, and Emirau. He participated in the initial assault wave during the invasion of Emirau. While directing his squadron's attacks against the Japs, he underwent numerous bombing and shelling raids and got in "lots of foxhole time." Before entering the service, he was a member of the architectural firm of Cross and Cross in New York City. — Another leatherneck who has been right in the thick of it is Charlie Endweiss, who holds the rank of major. He has completed two tours of duty overseas, having been in Hawaii, the New Hebrides, Palmyra, the Russell Islands, Munda, and Guadalcanal, and recently in the attack on Guam. After graduation from Technology, Charlie immediately started flight training at Pensacola, where he received his wings in September, 1937. At the time of Pearl Harbor, he was stationed at San Diego and left the next day with a fleet air photographic unit as material officer. In his latest trip overseas he served as commanding officer of a fighter squadron at Palmyra Island and then operations officer in the Solomons. — Frank Phillips has been transferred from management of the Elizabeth area to that of the New Brunswick area of the New Jersey Telephone Company. His previous experience included assistant managerships at Elizabeth and Jersey City.

Now for our social section — weddings and engagements. I've already mentioned above that John P. Hamilton was recently married to Harriet Kennedy of Buffalo. The wedding took place in New York on July 22. The bride is a graduate of Barnard College and of the University of Buffalo Law School and was employed in the legal department at Curtiss. Gerard Chapman has joined the procession by taking for wife on September 23 Alice Riley of Cloquet, Minn. The bride was graduated from the University of Minnesota School of Journalism and is on the staff of the Duluth *Herald* and *News-Tribune*. Gerard works at research in Cloquet. Francis Danforth, Jr., was married in Paris, Ky., on October 30 to Elizabeth Chapman, a graduate of the University of Kentucky, who is with the Office of Internal Revenue in Louisville. Danforth is working for the Corhart Refractories Company there. Engagements include those of Hawthorne Brown and Ruth Bacon, Paul Whittier and Mildred Button, and Oscar Fick and Constance Lewis, a lieutenant in the Women's Army Corps. — Before closing, I might mention that I'm still doing business at the same stand, the laboratory of the Linde Air Products Company in Buffalo. Jim Patterson, who was here with me, has recently been transferred to the New York office, and I see him occasionally. He is married and a proud father — as aren't they all? — ANTON E. HITTL, *General Secretary*, 530 Norwood Avenue, Buffalo 13, N.Y.

1943

Apologies are due from me for having missed an entry in the class notes columns for December. My time was divided between a session in the hospital, an unusual amount of work, and perhaps a little good old procrastination, so that when the due date arrived, I was unable to offer a single word. You probably know by now that Jack Tyrrell, whose naval duties as an ensign make it impossible for him to continue for the time being as our class agent, has resigned, and Harry Ottinger has assumed the tasks, worries, pleasures (?) — to say nothing of the responsibilities — of this important class office. As Jack has informed us, our Class is still a long way from the 100 per cent mark for contributors and for the dollar quota. Let's give Harry our support and push this Class over the top in the next two or three weeks! Procrastinators, let's mail that contribution today!

Looking through the newspaper clippings at hand, I find that Susette Lee Silvester and Allen Kirkpatrick, an ensign in the Naval Reserve, were married in Washington on September 2. A little less than a month earlier than this, on August 5, Mrs. George Eustis Goodman became Mrs.

William Post. The wedding took place in Chevy Chase, Md. Bill is a lieutenant, junior grade, in the Navy and is at present stationed in Washington. In Baltimore on September 23 Curt Smith and Barbara Elizabeth Demarest were married. August 12 was the wedding day for Eileen Herrick, who is now Mrs. Barrett Russell. The Russells were married in New York. Virginia Jones, whose home is in Peoria, Ill., is now Mrs. Frank Bowdish. As Frank is working with Professor Gaudin at the Institute, the Bowdish home is in Boston. Eleanor Hammond Baldwin and Stephen Higgins, were married in New Haven, Conn., on September 9. Lieutenant and Mrs. Higgins are now in Clovis, N.M., where Stephen is stationed with the Air Forces.

Among those who have made their marital intentions known are Mary Elizabeth Walker of Maplewood, N.J., and Eugene Davis. Pierre Portmann is shortly to take a wife in the person of Barbara Mead Straub. Pierre is a research engineer with the Sperry Gyroscope Company in Garden City, Long Island. From Pratt, Kansas, we have word to the effect that Marianne Lydia Glad will soon become Mrs. Carroll Hornor. Carroll is in the Army Air Forces at present. And finally, from the Far West, we learn that Lenore Van Dyke and Frederick Wolff are engaged.

Jim Robinson, now a lieutenant in the Navy, is due a word of congratulation for we have heard that he played a large part in the calculations and figuring involved in raising the 8,000-ton *George M. Humphrey* from the bottom, where she lay in 80 feet of water a mile or two northeast of Mackinaw City, Mich. This ship sank in 14 minutes after a collision with the freighter *D. M. Clemson* in June, 1943. As she lay in the fairway into the State Ferry Dock in Mackinaw City, the authorities wanted her cut up for she was thought to be unsalvageable. A Norwegian captain, John Roen, however, declared that he could salvage her. He and Jim did do just this, for in October of this year that ore ship, now the *John Roen III*, was towed into Sturgeon Bay ready for refitting. Not only is the feat in itself worth recording, but we understand that she was the largest vessel ever to have been salvaged from the Great Lakes.

Simon Gluck is a lieutenant, junior grade, aboard a destroyer and has a San Francisco fleet post-office address these days. Another naval man, John Stetson, an ensign, has recently been graduated from the indoctrination school at Tucson, Ariz. We hear that Cecil Alexander, a captain in Marine aviation, is still in the Pacific with a dive bomber and even though he has had a few very close calls, he is still delivering the goods where they can hurt the most. Bob Casagrande and Kathleen Grady were married on October 18. Bob is with the Shell Oil Company doing research in their Houston laboratory.

Again we take pleasure in welcoming a new name to this column, for we have a mass of good news about the doings of Gerard Shushter, a Marine captain who won his wings with the Royal Canadian Air Force in May, 1941, and in 1942 transferred to the United States Marine air force. He was a member of the famous "Fighting Corsairs," a Marine fighter squadron, and participated in 35 combat missions against Japanese-held bases in the central and northern Solomons, operating from Guadalcanal and Munda. He has been credited with sinking two enemy supply barges near Kolombangara Island. After leaving this famed squadron, he served as operations officer with a ground unit in the Solomons. Before returning to this country, he was the commanding officer at a base on Efate in the New Hebrides Islands.

Bill Thurston writes as follows: "Frank Wilbour is still with Consolidated down in Fort Worth, Texas, doing design and development work, in aerodynamics, I believe. He and six others each own one-seventh of a small aeroplane in which they take turns at increasing their skills as pilots in their spare time. Ken Wadleigh, an ensign, has only recently returned from the Pacific arena and expects to be stationed somewhere in the United States for several months doing some technical work. Waldo Davis has also recently returned from the Pacific, and he and his wife, Kay, are living in Boston for several months while Waldo is getting some specialized training at Harvard. Ray Richards and Bailey Nieder have recently been seen around the Institute. As for myself, I have been at General Radio Company in Cambridge doing development work on radio and similar test equipment. The work is extremely interesting. Not much of importance has happened, however. The new students coming and going so quickly make one feel like an old man."

Finally, a letter from Bruce Horst reads, in part: "Since getting out of Officer Candidate School in May, 1943, I have covered about one-half of the United States and still haven't touched foreign soil. For the three summer months of 1943 I was at Camp Davis, N.C., keeping the antiaircraft equipment down there in order. I then joined a brand new antiaircraft ordnance company at Camp Edwards, Mass., and was with them for three months, spending one month of the three at Aberdeen Proving Ground going to the antiaircraft artillery school. I then transferred to the Air Forces and went through pilot training in grade — which gave me about eight months in Texas. I got my wings in August and for the past month have been here at Lincoln, Neb., awaiting assignment as a copilot on a B-17 or B-24. I expect to leave here any day now and when I do, I shall have about 80 days left in the States. I often hear from Gregory Gagatian. He is a lieutenant, junior grade, and spends half his time at Elizabeth City, N.C., and half at the Naval Aircraft Factory in Philadelphia. I also hear from Stewart Hill, who is working for a silverware company in Wallingford, Conn. At last report, he had been placed in 1-A."

And so we bring the year 1944 to a close — a year plumb full of things to talk over in times to come, when we can not only think of a class reunion, but actually have one. I hope, as I know you do, that that meeting can be soon, but in the meantime, happy New Year and the best of luck. — CLINTON C. KEMP, *Secretary*, Barrington Court, 988 Memorial Drive, Cambridge 38, Mass.

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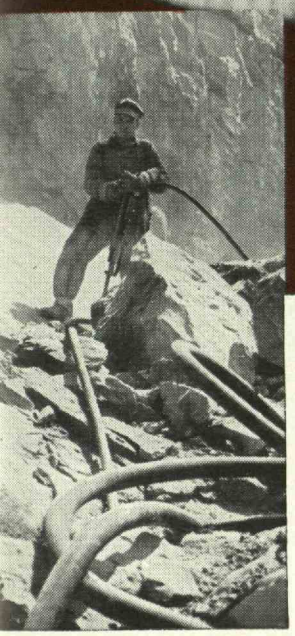

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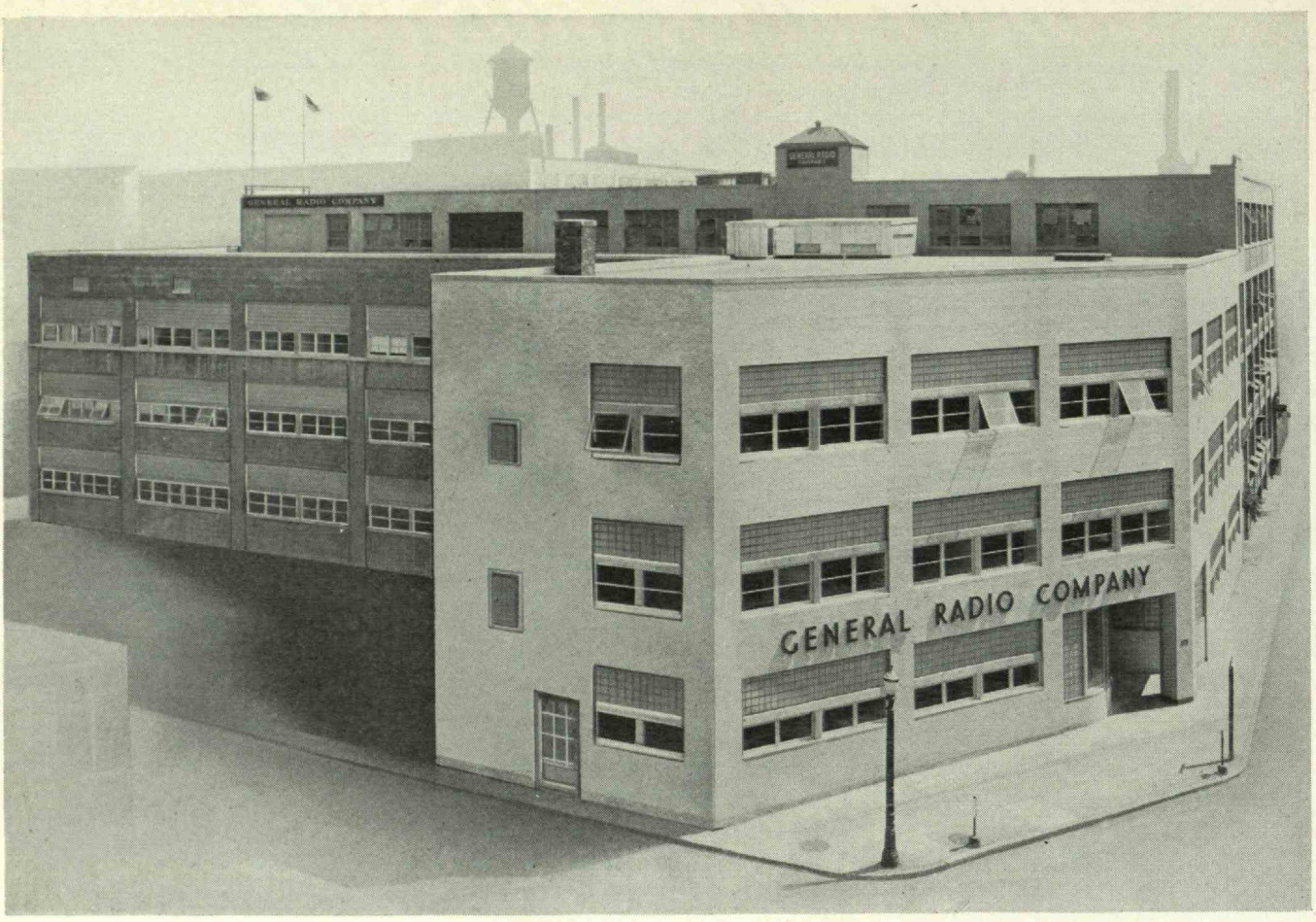


JUST AROUND THE CORNER

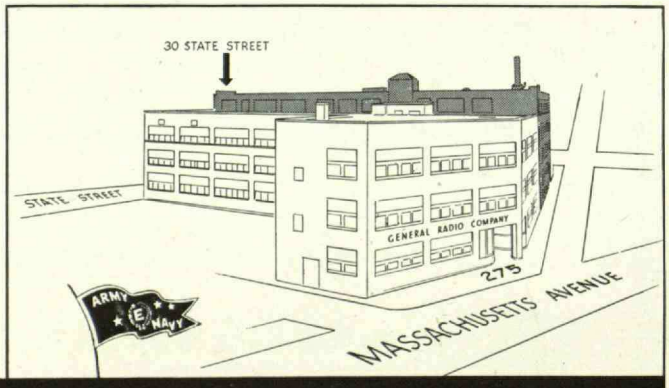
LATELY, persons corresponding with us have noted a new address . . . 275 Massachusetts Avenue. We've moved our engineering and general business offices into a remodeled building at this location. It's just around the corner from 30 State Street, which is still ours, and which is now devoted exclusively to manufacturing.

For a long time we have felt the need for rearranging our space; for one thing we have been badly cramped in the shop; and our engineering department has been spread over several floors and mixed up with many other activities.

The new building, which is connected by ramps on all floors with the older one, provides about 30 per cent more manufacturing space, and allows all of the engineering department to be on one floor.

Under pressure of the war we have expanded our output in several ways. We have let out the manufacture of several instruments to subcontractors; we have turned over the designs, drawings and models of several instruments to other manufacturers for their exclusive use; we have rented considerable extra space in two outside buildings, in one of which we have contracted for a large number of war-time workers under our own foremen.

After the war when the armed guards have left us, we hope that you will come to see our new laboratories and offices. In the meantime we continue to devote our energies to filling war orders for electronic laboratory test equipment.



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